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SCIENCE AND INDUSTRY

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Highlights Of This Issue

• Wartime Construction

As the skill and ingenuity of American contractors bear fruit in ahead-of-schedule completion of many wartime construction jobs, others push on toward that same goal. In this issue are described the work on an important industrial route in Massachusetts, the paving of asphalt runways at a large southern airport; and a particularly interesting and unusual use of the tractor-bulldozer combination for dirt moving at a large earth dam project in California.

See pages 1 and 7.

• Grade-A County Stockroom

A feature of the central garage of the Lancaster County, Nebr., Highway Department is its well-planned and well-kept stockroom and stock-issuing facilities, making for efficiency and economy in maintaining and checking on county equipment. This and other features of Lancaster County highway work are described in this issue.

See page 2.

• Hillside Batching

Utilization of a hill for top loading by trucks to the aggregate batchers and other features of the batching plant layout on an Indiana concrete paving job, which contributed to speed and efficiency in batching, might well be adapted to wartime projects where speed is the essential watchword.

See page 2.

• Plant-Mixed Stabilized Base

The methods which produced stabilized-base aggregate and a surface treatment for 6 miles of highway in Iowa last summer, with the aggregate produced under a subcontract, are described in this issue. See page 9.

• Proper Care of Diesels

"Long life to you" is the toast to all construction equipment today. Definite methods of insuring an extended service life for diesel engines are outlined in this issue.

See page 15.



C. & E. M. Photo
Shoeing a pile to try for specified penetration.

Not Enough Borings; Piles Show Them Up

Another Case Comes to Light Where Economy in Borings Leads to Wrong Assumption on Part of Designers

ON FAP 765 in Iowa, a bridge on Highway 261 over the Cedar River, just south of Mt. Vernon, the almost age-old trial of inadequate borings came up last summer. To determine the basis for design and specifications, engineers of the Iowa State Highway Commission made borings on each shore of the Cedar River and found sand overlying the bedrock.

(Continued on page 43)

Penetration Macadam With a Double Seal For Industrial Route

MASSACHUSETTS penetration-macadam roads are well-known for their wearing qualities, low maintenance costs, non-skid surfaces, and for the roar of tires when cars are operated at speeds of 40 mph and over. The solution of the noise problem has been in the minds of Massachusetts Department of Public Works engineers for some time and short experimental sections of penetration macadam with a double seal have been laid. The first major project of this type with an asphalt-emulsion seal is now nearing completion.

The highway is not on the strategic network and has no identity as an access road. It is on the Federal-Aid system and is substandard, so the WPB gave this project for the improvement of 2.33 miles of Mass. 107 in Saugus and Revere a P-19-e preference-rating order and a project rating of A-7 because of the exceedingly heavy necessary industrial traffic it carries 24 hours a day.

The Penetration Macadam

The bottom-course stone, a broken trap rock from the Lynn Sand & Stone Co., was dumped from trucks and spread by hand at variable depths to take up slight inequalities in the subgrade. The coarse stone consisted of 60 per cent

Massachusetts Improves a Substandard Federal-Aid Road; Non-SN Highway Has High Preference Rating

No. 1 stone averaging 2-inch screen size but ranging from $2\frac{1}{2}$ to 1-inch, and 40 per cent No. 2 stone averaging 1-inch screen size but ranging from $1\frac{3}{4}$ to $\frac{1}{2}$ -inch stone. This stone was rolled by a 12-ton Buffalo-Springfield and an Acme roller, and filled by hand with dry stone dust, broomed thoroughly to fill all voids. The top-course stone, all No. 1 stone, was then spread 10 feet wide in three lanes by a Nickerson spreader box and the balance of the 33-foot roadway covered by dumping direct from the truck and spreading by hand. The top-course stone was all hand-spotted and compacted by the 12-ton rollers.

The top-course stone was then penetrated in 11-foot lanes with 1.5 gallons per square yard of 85 to 120-penetration asphalt, depending on the season of the year, at 350 degrees F. by the Trimount Oil Co., using Etnyre 1,000-gallon and 2,500-gallon pressure distributors. The asphalt was applied by starting at the left side so that the truck driver could watch the left edge readily, then the second lane was applied down the center and last the right lane. The penetrated top course was smoothed out by a roller weighted with water in the wheels and then immediately filled with about 20 pounds per square yard of $\frac{1}{2}$ -inch keystone, using the newest type of Buckeye spreader box to fill the voids flush with the top of the coarse stone, spread uniformly over the entire surface by a drag broom, and then rolled.

The Double Seal

In order to reduce the roar on the

(Continued on page 10)

Air Base Runways; Plant and Methods

Plant-Mix Asphalt Paving For New Large Southern Airport Laid on Prepared Sub-Base by Contractor

FROM drainage through subgrade preparation, plant-mixed base and top, spreading and rolling, the construction of the runways at a new large airport in the south offered unusual problems which were solved by the application of common sense and ingenuity on the part of the U. S. Engineer Department and the contractor.

As the field is to be operated as an all-over field for landing, no slopes greater than $1\frac{1}{2}$ per cent were permitted throughout the entire area. By taking advantage of contours and careful location of catch basins, the runway crowns of 1 per cent were continued to all catch basins with slopes varying from $\frac{1}{2}$ to $1\frac{1}{2}$ per cent.

There are three runways: one is 150



C. & E. M. Photo
A creosoted-pile bent and concrete-beam structure on the 2.33-mile improvement on Mass. 107 in Saugus and Revere to provide better facilities for heavy industrial traffic.

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A Grade-A Stockroom At a County Garage

**Lancaster County, Nebr.,
Takes Blue Ribbon for
Well-Planned, Well-Kept
Stock-Issuing Facilities**

(Photos on page 52)

LANCASTER County, Nebraska, the county seat of which is the State Capital, Lincoln, recently completed a new addition to its old central garage just west of the city, more than tripling the facilities for repair and storage. The original garage was converted into offices and a "blue ribbon" stockroom, and the second floor into a small auditorium used for monthly get-together meetings of Engineering Department employees during the winter.

In addition new storage sheds were constructed to house all materials and equipment that might deteriorate through outside storage. The south storage shed along U. S. 6 has a stone base and stained white-pine siding and the strip of ground between the shed and the street is simply and attractively landscaped.

The Office Building

The office building, which includes the stockroom, provides, in line from the repair shop, an office for the Shop Foreman, the storekeeper's office, the entrance lobby and clerk's office, a larger office for the bookkeeper, and at the end the unloading room through which stock is delivered to the storeroom. The building, or wing as it is now, which houses these offices and the storeroom measures 48 x 69 feet, while the storeroom itself is 34 x 69 feet. The employees working in this section under the storekeeper are the bookkeeper, the clerk or general office man, the stock man and a gasoline delivery man.

The Stockroom

At the extreme southerly end of the stock or storeroom is the oil heating plant for the entire group of buildings. The major feature of the stockroom is that all storage racks are 6 inches off the floor, permitting easy cleaning of the entire floor which is of concrete, painted gray and with an inexpensive composition tread laid over the floor where it is most used. The racks have all been designed for the specific purpose for which they are intended and were all fabricated in the machine shop by welding. The bins and shelves for small parts, such as bolts and nuts, were designed in the shop and the job of fabricating them given to the NYA unit in Lincoln which did an excellent job of producing something more than fifty sets of sheet-metal shelving with adjustable wooden partitions. The motto in the stockroom is "a place for everything" and we need not finish it because that is

just where everything was.

Starting at the south end of the stockroom and working our way around clockwise gives a very fair picture of the way each type of equipment and parts is stored in the most compact manner and for easy moving. A metal rack comprised of 2-inch gas pipe and square reinforcing bars provides handy storage for signs which are ready to go out into service. Beneath the signs are wider racks for the storage of coils of wire and the top is a wood shelf for storing small cans of various kinds of paints.

On the floor of the storeroom is a series of heavy A-frames made of 2-inch pipe and $\frac{1}{2}$ -inch and $\frac{3}{4}$ -inch pipe nipples which are used to store as much as 5 tons of blacksmith steel up to 20 feet long, with the heavier steel at the bottom on the $\frac{3}{4}$ -inch nipples. A similar rack next to this but with longer nipples at the top and along the top bar is used for hanging shovels, spades and scoops, while chains, second-hand and new in the original bags, as well as brooms, crowbars and axes are stored on the crossbar of the A-frames. At the bottom of this frame is a deck for storage of ax and sledge handles.

Next in line is a square rack with a center pipe for hanging blocks and tackle and a bottom deck for storing such heavy metal equipment as screw jacks, pots for survey markers, addi-



C. & E. M. Photo
The south equipment shed at the Lancaster County, Nebraska, Central Garage just west of Lincoln.

tional storage for new chains in bags, and at the very top an ample supply of cross-cut saws with their handles in a bin below. In this same rack are found scythes, squares and straightedges, all in place and all included in the perpetual inventory carried by the County Highway Department.

Adjacent are two low racks with the platform 6 inches off the floor for storing grader blades, of which the county has been fortunate in laying in an adequate supply. A similar rack of 2-inch pipe and a deck of 2 x 8 lumber bolted in place is used for the storage of about 10,000 pounds of nails in kegs. Two more of these low platforms are used for storing a year's supply of surveying stakes.

A heavy 4-caster warehouse cart made in the shop and with the bed at the same height as the top of the decks is very

handy for moving heavy materials around the stockroom and shop. Near the center of the stockroom are four 60-gallon tanks for dispensing different grades of lubricating oil. Adjacent is a rack for one-quart bottles of lubricant and a small grease drum with a crank at the top of it. Turning the crank does not make music, but it certainly brings harmony to the hearts of the grease monkeys, because by turning the handle an oil pump in the bottom of the drum, taken from an old Chevrolet engine, pumps grease out a $\frac{3}{8}$ -inch nozzle, and does a fine job in filling the compressed-air lubricating gun used in the shop.

From this point west one comes to the sheet-metal shelving fabricated by the NYA. In the first set of shelves the heights are variable, so that materials of different types will fit in better, but the bulk of the shelving is of standard height with the $\frac{1}{4}$ -inch wood partitions held in place by two screws at the front and two at the back which permit the partitions to be moved 6 inches either way to enlarge the bins from a minimum of 6 inches to any multiple of 6 inches. The front of each bin is a continuous card holder into which the labels showing the contents of each bin are slipped after typing. The first one of these racks has five shelves and is used for miscellaneous storage, including welding rods. Then another five-shelf rack has special intermediate shelves for welding rod, key stock and drill steel rods. In this same rack are stored wood handles, red highway flags already mounted on their staffs, oil-filter elements for all of the equipment, brake fluid, inner tubes in their original packages, and a stock of 1-gallon oil-dispensing measures.

The next rack is devoted entirely to grader parts, with the wider shelving at the back used for the storage of gasket material and printed signs ready for emergencies and reading "Bridge Out", "Road under Repair—Detour" and other similar wording.

An additional four of the standard racks contain mower parts, tractor parts, and both roller and ball-bearing assemblies. Then three adjacent racks are devoted to pipe fittings, welding rod, and miscellaneous hardware such as files, hacksaw blades, couplings, etc. Another pair of racks with bins contain a stock

(Continued on page 16)

Hillside Batching Cuts Loading Time

Method Used on 3.857-Mile Indiana Job by R. McCalman Has Features Valuable for Use on Wartime Projects

(Photos on page 52)

SELECTION of a site for batching that permitted using a loop road with the two separate aggregate batchers placed against a hill for top loading direct from trucks, with adequate space for all material storage within the loop, and the office and cement batcher near the exit, featured one of the R. McCalman, Inc., contracts on U. S. 40 east of Brazil, Ind., last season. The paving outfit was well balanced throughout and regularly poured 125 feet per hour of 9.7-9-inch section 22 feet wide.

The Batching Plants

About 100 yards off the right-of-way, near the center of the contract, two batching plants for aggregate were set up against a hill. One plant was used for the coarse crushed limestone and the other for the fine crushed stone and

sand. The 2-batch trucks drove through beneath the coarse-aggregate batching plant to receive the material from the Johnson batcher and then backed under the second plant for the two other aggregates weighed out by two Johnson batchers. Driving straight ahead about 150 feet, the trucks stopped beneath a Johnson Dutch Mill bulk-cement plant and received their appropriate weights of portland cement delivered into two separate containers.

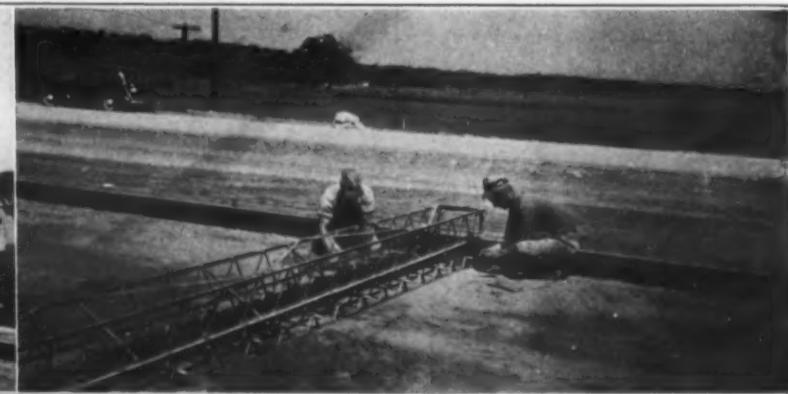
Adequate stockpiles of all three aggregates were maintained at the batching plant and a P & H crane with a clamshell bucket loaded the batching plants from these stockpiles when needed, such as during the noon hour when the trucks from the aggregate-producing plant quit for lunch. The cement was hauled 7 miles in covered trucks direct from the producing plant except that, because of Federal regulations, the cement was first loaded into cars, shunted less than $\frac{1}{4}$ mile, and then unloaded into the hauling trucks. For handling the batches from the plant to the paver, the contractor ran a minimum of eight trucks and a maxi-

(Continued on page 40)



C. & E. M. Photos

Pouring concrete for the 22-foot thickened-edge slab on U. S. 40 east of Brazil, Ind. Note the expansion joint in the foreground. The double-truss device shown at the right was used to check the elevation of all dowels just ahead of concreting. The men are adjusting the pressed-metal dowel supports.



Laying TEXACO Asphaltic Concrete surface on 3½-inch "Black Base" (also TEXACO Asphaltic Concrete) in Paris, Ky.



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1. "Black Base," whether plant-mixed Asphaltic Concrete or Asphalt Penetration Macadam, is surfaced as soon as cooled to air temperature. No time lost for curing.
2. The flexibility of "Black Base" keeps it in complete contact with the subgrade. This assurance of constant subgrade support for every square yard of "Black Base" saves money by permitting use of a relatively thin base.
3. A "Black Base" and asphalt surface naturally form a perfect bond, producing a resilient unit from surface down to subgrade.
4. Choice of "Black Base" saves time, because the same equipment is used in the construction of both base and wearing surface.
5. Repairs to "Black Base" are made speedily and economically. A patched area quickly becomes an integral part of the base.
6. "Black Base," being unaffected by temperature changes, is not subject to cracking, which in rigid bases eventually causes corresponding cracks to appear in the surface.

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There Is More to Old Steel Than Scrap

The steel scrap salvage campaign is in full swing, with individuals sacrificing everything from desk ornaments to old juice extractors. Outstanding scrap-collection programs have already received considerable publicity, such as that sponsored by International Harvester among farmers, the notable shipments by the North Carolina State Highway Department and the remarkable factory house-cleaning programs under the direction of the Automotive Council for War Production. We need scrap for our scrap, to use in good American steel to fight the Japs and their senior partners, the Axis.

There is another side to the scrap campaign. We must not ruthlessly wreck every structure of steel or every piece of old equipment in order to feed the hungry mouths of our steel furnaces. Some of the structural steel in old bridges, elevated railroads and buildings that are obsolete and ready to be torn down can be converted directly to essential services immediately without expending valuable hours, materials and labor in transportation, melting, rolling and re-shipping. Much obsolete or worn-out equipment lying around your yards can be placed in construction or maintenance service again by making repairs or changes, or by salvaging a part of it for other use, instead of scrapping the whole unit. In this way we can make great progress toward real conservation and salvage in order that more effort and materials may go directly to war.

One of the most important conservation programs today is the salvaging of old steel bridges. Except in a fraction of a per cent of all cases, new bridges of steel or reinforced concrete cannot be built to replace old structures whose age and design for lighter loads make them obsolete today. We cannot replace these structures, we cannot close them to wartime traffic, so they must be kept in service. Many state and county highway departments have done notable work in rehabilitating old steel bridges by strengthening the weaker members with steel scrap or plates welded to those members. In other cases welding has been used to replace rivets, resulting in a reduced dead load and an increased live-load capacity.

In the allied field of steel buildings, *The Steel Constructor* of the American Institute of Steel Construction points out that, "Steel recovered from the buildings erected for the New York World's Fair, which closed the year France fell to Germany, is being used to fight the invaders. Some has been incorporated in gun mounts, some in cofferdams for the U. S. Navy, and some in wartime plants and buildings." Then in the opening paragraphs of an issue devoted entirely to "Salvage Values" it states, "Not all old steel is scrap. Many old steel structures can be easily rehabilitated and given a new life of usefulness . . . These

structures may often be salvaged without the use of additional material. In other instances, a major rehabilitation may be accomplished by reinforcing a few of the members of the frame, by removing some members, or by adding new members."

Give serious active thought to the immediate use of your "scrap" to carry on your wartime work. Then collect all the scrap that really is scrap and put it to work in the steel mills to contribute its share to Victory.

ARBA President Joins Engineer Corps as Major

Chris J. Sherlock, President of the American Road Builders' Association, has been commissioned a Major in the Corps of Engineers, U. S. Army, and assigned as Operations Officer for the Denver, Colo., District of the Corps.

Major Sherlock had served with the Alabama State Highway Department for a number of years as draftsman, instrument man, resident engineer, division engineer, assistant chief engineer, and chief engineer, before becoming Director of the Department in 1939, which position he resigned last February. He has also served as a Vice President of the American Association of State Highway Officials.

Bituminous-Materials Restrictions Applied To Additional States

At the request of the Petroleum Coordinator for War, the Public Roads Administration is extending control over the use of bituminous materials in highway work from the seventeen Atlantic seaboard states previously affected to include twenty-one additional states. The procedure to be followed by all governmental agencies in the new area in applying for bituminous material will be the same as that used previously in the seaboard states. (See C. & E. M., June, 1942, page 41).

The states included in the new control area are Alabama, Arkansas, Florida west of the Appalachicola River, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Mexico, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, Texas, and Wisconsin.

This new restriction is based on an amendment to Recommendation 45 issued on April 24 by the Petroleum Coordinator, restricting the use of asphaltic or tar products on highways or streets for construction, reconstruction, maintenance, or repair, except in the cases of streets or highways certified by the Public Roads Administration as necessary to the war effort, and for which the use of asphalt or tar is deemed essential.

Application for the use of bituminous materials must be made on a special form, B-1, copies of which are available from the state highway departments or district or states offices of the Public Roads Administration.

Highway Research Board Proceedings for 1941

Volume 21 of the *Proceedings* of the Highway Research Board, including papers and reports presented at the Twenty-First Annual Meeting held last December, is now available. These volumes of *Proceedings*, covering as they do such a wide variety of subjects in the road field, have become standard reference works on highway technology.

Copies of Volume 21 are available direct from the Highway Research Board, 2101 Constitution Ave., Washington, D.C. Price: \$3.25.



"It helps them pass an enjoyable lunch hour."

"Manana" Is the Word For Highway Building

It is not laziness that has brought about a postponement of highway improvements for the duration but rather the determination of all highway interests, as expressed by Charles M. Upham, Engineer-Director, American Road Builders' Association, that "all available men, machines and materials may be used for access roads to military and industrial establishments and for strategic highways used for defense transportation and airports. Since full speed ahead on these projects is vital to the war effort, many badly needed improvements on highways carrying heavy peacetime traffic must be deferred till after we win the war. Planned now, these post-war highway projects will be ready to provide immediate means for putting the large labor force now engaged in war work back into productive peacetime employment without a disastrous economic set-back."

The new ARBA slogan "Put off till tomorrow what can't be done today" holds the key to the solution of many major economic problems that will follow the war. Highway transportation, now speeding the movement of war supplies and workers, will come into its own after the war. Country-wide expansion will demand inter-regional highways, super-roads, relief of congestion in cities and their metropolitan areas, and numerous other street and highway improvements. Road surfaces, and even bases, are being destroyed by the constant pounding of heavy war traffic while other important arteries are being neglected because of the concentration of activity on essential war projects. A large highway construction program will therefore be an imperative need after the war.

The conclusion of the present worldwide war will release many millions of men from the fighting and factory fronts. An authoritative estimate for the year 1944 indicates that 50,000,000 men or 80 per cent of our normal labor force will be engaged in war factory operations or in the military forces. This manpower can be effectively utilized in a post-war program of road building through highway projects of any desired size that will best meet the needs for employment and the use of material and equipment. It has been demonstrated that highway construction furnishes more work per unit of expenditure than any other leading public works enterprise.

There is need for immediate study and planning for post-war road building, a fact being emphasized constantly by the ARBA. The last war provided the lesson that failure to prepare for peace can be almost as disastrous as lack of preparedness for war.

Buy War Bonds and Stamps. A share in Victory and Freedom is the best investment in the world.



"Know what I'm really homesick for—pavements!"

USEFUL ON VITAL WAR CONSTRUCTION JOBS

In the present crisis war construction must be rushed to completion . . . equipment must be kept at it day after day, 24 hours a day if necessary. A major step toward this goal is a wider use of modern and efficient road building and maintenance machinery . . . the kind that Galion builds. Galion is a dependable ally in the all-out war effort.

Galion graders and rollers are being proved in day after day of constant service . . . are rushing many vital jobs to successful completion. The Galion Chief road roller is shown left and the big No. 101 motor grader may be seen below . . . both working on war construction jobs.

ROLLERS • GRADERS • SPREADERS

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MAIN OFFICE AND WORKS: GALION, OHIO





Portal of the new timber-lined Sunset Tunnel in Oregon.

Treated Wood Lining For Tunnel in Oregon

An interesting type of tunnel-lining construction, utilizing pressure-treated Wolmanized timbers, and high-gloss white traffic lacquer to "daylight" the interior are features of the recently completed Sunset Tunnel on the Wolf Creek Highway between Portland and the Pacific coast. In this section of the country, which is well known for its structural timber supply, treated-timber construction is not unusual, but its use as a tunnel lining as well as for bridges and culverts might well be adopted in other sections of the country, in order to conserve steel for the Victory effort.

Designed under the direction of R. H. Baldock, Chief Engineer of the Oregon State Highway Commission, this new tunnel has stone-masonry portals, 3-foot sidewalks, a 28-foot roadway, and framed timber bents set on 4-foot centers. Approximately 357,000 feet of prefabricated 12 x 12-inch treated posts, segments, caps, and 4 x 10-inch and 4 x 12-inch lagging and headers were employed.

The framing details include posts, caps and segments cut to a circular arc, with seven segments to each rib. Except for 16 feet of tunnel timbered on 2-foot centers, the timbering was spaced 4 feet on centers. The backs of the segments were close-covered with 4-inch lagging. Each joint was blocked on the back with Port Orford cedar. The remaining space behind the lagging was filled with gravel screenings to the top of the second segment. Red cedar cordwood was packed lightly above that.

A comparison of the cost of this type of lining with that of concrete indicated that the timber lining cost less than half that of the concrete. A relatively long life from the treated-timber lining is anticipated, but provisions were made in the design for the placing of a concrete lining inside the timber lining when the service life of the latter has been exhausted.

Upon completion, the tunnel was painted with three coats of white lacquer, ordinarily used for center striping.

415 Price Reductions

With so much published today on the raising of price ceilings, it is refreshing to learn of a sweeping price reduction.

HEATING KETTLES
Fire Proof—Oil Burning
Hand and Motor driven spray.
Many sizes. Write for catalog.

White Mfg. Co.
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tion. In accordance with its policy of reducing prices when possible to do so without lowering the quality of its products, the Elastic Stop Nut Corp., 2330 Vauxhall Road, Union, N. J., has announced reduction in prices of 415 items of anchor, gang-channel, and instrument-mounting types of Elastic Stop Nuts. The reduced prices became effective July 1, 1942, and apply to the unshipped portion of all open orders as well as all new orders received on and after July 1.

A new 8-page folder has been issued covering all of these items and showing the old and new list prices. A copy will be sent promptly by the manufacturer to those mentioning this item.

Accuracy and Speed In Fine-Grade Work

The accuracy and speed with which the subgrade is cut to proper cross section has much to do with the speed of concrete paving and the control of costs. The Standard subgrader, made by the Standard Steel Corp., 5001 So. Boyle St., Los Angeles, Calif., from the Hurst Lewis design, is built to perform the whole operation of preparing the subgrade. The manufacturer reports that rock as large as 14 inches mixed with the subgrade dirt has been successfully handled.

The smallest Standard subgrader is built 6 feet in width, while widths up to 30 feet are available by adding multiples of extensions in the center of the machine. This may be done with no deflection of the trusses even when varied to 30 feet in width. Mechanical hoists raise and lower the machine for adjustments, eliminating all hand jacking. This feature is valuable when crossing manholes, culverts, intersections and other obstructions.

A feature of the Standard subgrader which cuts down labor costs on the job is that it cleans up all excess materials right up to the forms. It works equally well uphill or down and around curves. It is built with heavy-duty construction, and the special solid rubber tires, which are made thin for accurate cutting, eliminate the breaking of edges of the adjacent concrete slab when one side of the machine is running on the concrete.

Bulletin No. 603 which may be secured from the Standard Steel Corp. illustrates and gives further information on this machine.

CLEAN AIR
is vital to efficient valve action. Clean your air filters regularly... and often with a non-inflammable cleaning solution.

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★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

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every Sunday night—CBS

YOU can keep your air compressors operating continuously at full rated capacity... with valves opening wide and shutting pressure-tight... when you use Texaco Alcaid, Algol or Ursa Oils.

These Texaco oils are highly resistant to gum, sludge and carbon formation. Their use assures free rings, active valves, open ports, and clean air lines.

The outstanding performance that has made Texaco preferred in the

fields listed in the panel has made it preferred on prominent construction jobs throughout the country.

These Texaco users enjoy many benefits that can also be yours. A Texaco Lubrication Engineer will gladly cooperate... just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write to the home office of The Texas Company, 135 East 42nd Street, New York, N. Y.

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TEXACO Lubricants and Fuels FOR ALL CONTRACTORS' EQUIPMENT

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

Earth-Dam Material Loaded By Bulldozers and Tractors

**Clay for California Dam
Core Pushed Downhill to
Loading Hopper in Ravine,
Speeding Material Placing**

By FLOYD SUTER BIXBY

ONE of the most unusual and effective applications of the tractor-mounted bulldozer in a dirt-moving program came to our attention recently, illustrating excellently how versatile these machines are when they are used to their best advantage by wide-awake excavation-wise contractors.

A brace of bulldozers is being used to load 13-yard bottom-dump Euclids, the impressive fact being that a fleet of 16 units is being kept in high gear for one whole 8-hour shift on the daily 24-hour output of only two bulldozers. Loading these Euclids is usually thought of as a job for a dragline, shovel or elevating grader; something built to hoist its load over the top of the body 7 feet above ground. On this job, however, the natural topography was used with a man-made feeder hopper for loading.

The job is the new \$8,500,000 Santa Fe Dam, located in southern California in the San Gabriel and Rio Hondo drainage basins. The contractor is a joint firm, made up of Winston Bros. Co., J. F. Shea Co., Inc., Morrison-Knudsen Co., Inc., and Ford J. Twaits Co. of Los Angeles. All work on this contract is being done under the direction of the Los Angeles District Office of the U. S. Engineers.

The Dam and the Problem

The dam is being built up in several zones, ranging from coarse river-run alluvial boulders on the outside edges to a highly compacted impervious core in the center of the big barrier. Clay is scarce near the dam site, however, so a rather mountainous area was set aside in Fish Canyon, 5 miles away, to furnish some 1,400,000 cubic yards of high-clay content core material.

This borrow area is a series of clay-covered foothills 350 feet high, traversed by gullies eroded by run-off water in past years. For the most part the area was fairly accessible for a shovel-Euclid system of hauling, but this of course involved extensive preliminary bulldozer work in connection with the construction of access roads. Company officials noticed that many thousands of yards of earth were readily available on hillsides above the gullies if some satisfactory gravity system could be devised to load the Euclids in the ravine bottoms. Thus the idea for a portable easily erected loading hopper was born.

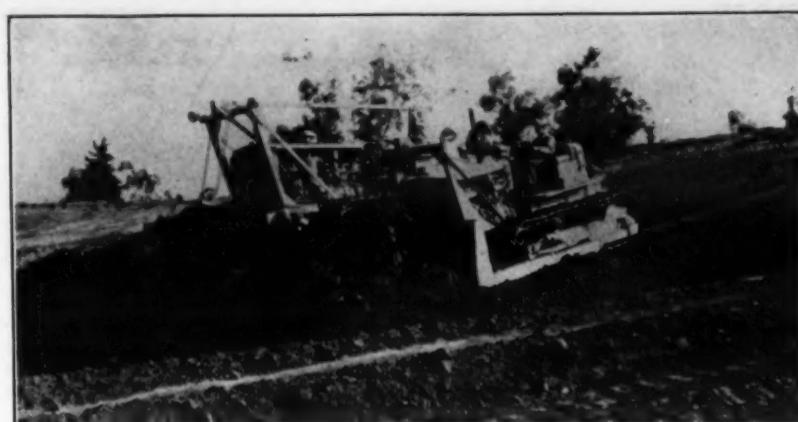
The first hopper was set up in the bottom of a natural gully in the center of a very heavy deposit of clay 40 feet thick. Clay knolls rose well up on the Sierra Madre foothill sides for 500 feet around the hopper, and provided an excellent

place to try out this loading scheme.

Hopper Details

The feeder hopper is 15 x 24 feet in overall plan, and 25 feet high. The actual size of the gated opening where dirt pours down into the wagons is 2 1/2 x 10 feet.

The 8 x 16-inch timbers 24 feet long were laid horizontally on 15-foot centers for mud sills to carry the weight of the structure with its earth load. On each sill eight 8 x 12-foot timbers were placed on end at 4-foot centers for piers. These uprights were tied by a horizontal 8 x 8-inch timber 5 feet above the floor line,



When the bulldozers were paired, they pushed as much as 10 1/2 cubic yards at one time to the runway leading to the loading hopper.

which was fastened to the uprights by 3/4-inch round steel drift pins. One pin was used at each timber junction.

A 4 x 8-inch timber scab was spiked to each of the piers immediately over the 8 x 8-inch wale. This timber caught the

bottom end of short 8 x 8-inch knee braces, set between the scabs and the feeder hopper floor sills, one brace at each upright pier. This whole framework supported and braced the feeder,

(Continued on page 30)

To Conserve Vital Man-Hours and Lay Concrete Faster use the *Whiteman* "3-Step" Precision Method



Step No. 1

The Whiteman Rodding Machine—operated by one man, keeps up with any method of concrete delivery, simultaneously levels and condenses the pour with its power operated screeds.



Step No. 2

Floating the slab is a quick, simple job for one man with the Whiteman Finisher equipped with "Heavi-Duty" Trowels.



Step No. 3

Finishing is fast, surfaces are harder when you use a Whiteman Finisher—with CRUCIBLE STEEL Finishing Trowels.

You can increase the labor capacity of your present crews 40% by equipping them with WHITEMAN machines for laying concrete slabs, indoors or out. You will produce better concrete even under adverse weather conditions. You will conserve man-hours and the slab won't "get away" from you.

On large or small areas, WHITEMAN Machines permit you to use a drier mix, lay it in less time with fewer men, and still deliver denser, stronger, level concrete, at lower cost.

Here's the WHITEMAN 3-Step method of placing better concrete slab faster.

1 SCREEDING — The power-operated screeds on the WHITEMAN Rodding Machine make 5-in. transverse strokes on the header boards, levelling and compacting the mix. A steady pull forward by the operator advances the machine. Low slump mix is no problem—4 yd. of 1-in. slump can be placed in 5 minutes.

2 FLOATING—Put the "Heavi-Duty" 12 gage steel trowels on the WHITEMAN Finishing Machine when ready to float the slab. One man can cover 1,000 sq. ft. in 15 minutes. The concrete is again levelled and compacted with moisture brought to the surface.

3 FINISHING—Attach the 17-gage steel "Finish" trowels to the same dual-purpose WHITEMAN Finishing Machine, then the operator guides the rotating, adjustable-pitch trowels over the slab. Without handwork, a smooth, level surface is finished in half the usual time. Again, one man covers 1,000 sq. ft. in 15 minutes.

Just two reasonably priced machines multiply the production capacity of your crews, permit you to complete your job ahead of schedule.

Manpower is too scarce to waste now when "Time is short!" If you haven't seen WHITEMAN machines saving time on Screeeding, Floating and Finishing work—wire today for the nearest distributor's name. He will show you how to conserve man-hours and place better concrete.



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Saw Rigs
Pumps
Rollers

C. H. & E. MANUFACTURING CO.
3810 No. Palmer St.
Milwaukee, Wis.



One of the new arc-welded Tournapull-powered trailers made by R. G. LeTourneau.

Huge Welded Trailer For Excessive Loads

A trailer weighing only 19½ tons, but which is capable of carrying 75 tons, or a heavier load than the average railroad freight car, is being produced by arc welding by R. G. LeTourneau, Inc., Peoria, Ill. If this trailer were built with cast steel parts, the job would have been impractical, but arc-welded construction permits maximum flexibility and strength, low cost and relative light weight.

The trailer measures 30 feet long, 14 feet wide, and requires 24 x 30 tires equipped with air brakes. The motive power is a Tournapull, also of welded construction. The two units complete weigh a total of 42½ tons. The arc-welding equipment used in the production of this trailer was supplied by Hobart Bros. Co., Troy, Ohio.

Color in the Cure Aids Concrete Work

The primary aims of concrete curing are to prevent or replenish the loss of mixing water during the early stages of hydration. It is frequently difficult, if not impractical, to keep the surface of the concrete moist. Due to these conditions, it has been found advantageous to seal in the mixing water with a coating material applied by spraying on the surfaces to form an impervious membrane.

Ritecure, a colorless membrane cure, was designed specifically for curing concrete by The Johnson-March Corp., 52 Vanderbilt Ave., New York City, the organization that developed the impervious membrane method, with which over 50,000,000 yards of concrete have been cured. Membrane curing holds the moisture in the concrete during the most critical period, thus preventing surface dusting, minimizing hair checking or crazing, and providing a surface with a maximum resistance to abrasion or wear.



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Combined All-Steel Side Frames and Base (50% stronger, hundreds of pounds lighter), Smoother Power, Silent Chain Drive. Sizes

6 to 100 H.P., Gas or Electric, 1 to 3 Drums.

Send for catalog, prices

THE JAEGER MACHINE CO.

702 Dublin Ave., Columbus, Ohio

Ritecure is said to offer maximum resistance to solar rays or other climatic conditions and may be applied under any condition consistent with the proper placing of the concrete itself. The effectiveness of this material has been further increased by The Johnson-March Research Laboratory. The compound now contains over 60 per cent solids, or about 25 per cent greater than any compound heretofore produced. It might be expected that such a high percentage of solids would result in a material entirely too viscous to spray, but such is not the

case with this newest Ritecure. The flash point of the compound also has been increased to approximately 150 degrees F., thus abating practically all fire hazard.

Inspection of colorless membrane curing has always been a difficult problem. The use of a color indicator now assures complete and adequate coverage and makes inspection simple. The color indicator stains the protective film green as it is applied and then, after a few hours, disappears entirely, leaving a colorless membrane. The advantages of this temporary color from the viewpoint of either the spray operator or inspector are obvious.

The producer states that, because of the nature of Ritecure and the method of application, a very thin film provides an evaporation-proof coating. One gallon of Ritecure will cover 30 to 40 square yards of concrete if it is applied as directed and before the concrete is dry. One coat is sufficient on any installation; additional coats are wasteful and unnecessary.

Longer Safe Service From Conveyor Belts

A veritable text book, encyclopaedia and maintenance guide is found in the 24 pages of Catalog Section 2800 entitled "Care and Maintenance of Conveyor and Elevator Belting," recently issued by the B. F. Goodrich Co., Akron, Ohio.

Conveyor belts have been much abused in the past, not only by the materials they carry but by improper maintenance of idlers, excessive tension, improper splices and repairs, and lack of attention to proper loading. All of these subjects and many other valuable instructions for the care and maintenance of belting, as well as chapters containing a wide range of belt data, valuable when considering installation and repair problems, will be found in this Catalog Section.

Copies will be furnished promptly by Goodrich to those requesting them and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

FIRST AID STATIONS to help keep your LORAINS on the FIRING LINE

Lorain distributors are out where things are happening—they are our first line of defense to help you do more with what you've got. Acting as **specialized** first aid stations, they are working 24 hours a day to keep equipment at peak performance and to make it last longer. Call on the one nearest you. Here is what he is prepared to do—

Furnish spare parts: 31 distributors, strategically located throughout the country, carry a representative stock of factory-made parts on hand and can give you quicker service on deliveries.

Rebuild parts in which normal wear is apt to cause trouble. Many Lorain distributors have complete facilities for this work and employ expert service men who know Lorain equipment.

Give on-the-job service: Many distributors maintain service trucks for speedy delivery of parts and field service right to your job. Fewer working hours lost with on-the-job service like this.

Serve as a clearing house for information on rentable equipment or booms you may need for converting present machines.

THE THEW SHOVEL COMPANY
Lorain, Ohio

Write for Thew Handbook

It's a condensed service manual which covers operation, adjustment, care and lubrication. It's packed full of information which every Lorain owner and operator should and probably does know, but a review of these facts will help you get more out of your present equipment—conserve it for the duration and a long time after. Give Lorain model and serial number when writing.

Processed Limestone For Stabilized Base

Methods Which Produced Aggregate and Completed Highway Base Without the Use of Critical Materials

(Photo on page 52)

A CRUSHING and screening plant set up in a limestone quarry near Tabor, Iowa, and equipped with two jaw crushers and a hammermill, passed muster in exactly 99 out of 100 tests on the finished product to meet Iowa specifications for stabilized-base aggregate. The one failure was on the initial test when there were not enough fines. Careful adjustment of the crushers and hammermill by the producers, E. L. and Don Kaser, a father-and-son team, of Adel, Iowa, put all the following tests right in the middle third of the sieve gradation.

Harco Construction Co. of Sioux City, Iowa, had the contract for road-mixing the stabilized base with prime and surface treatment for 6 miles on Iowa 184 east from U. S. 275 to Randolph.

Meeting the Aggregate Specs

The specifications for stabilized-base aggregate in Iowa are as follows:

SPEX	MINIMUM	MAXIMUM
Passing 1½-inch	100	—
Passing 1.05-inch	85	100
Passing 0.743-inch	75	100
Passing 0.371-inch	60	95
Passing No. 4	45	85
Passing No. 16	35	70
Passing No. 40	15	35
Passing No. 200	9	22

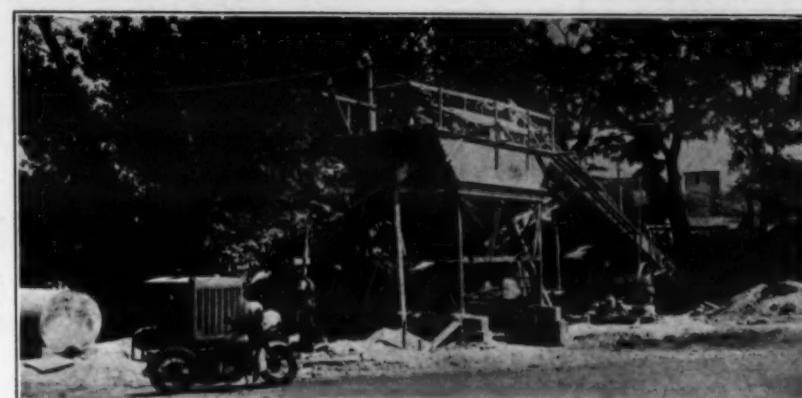
The fraction passing the No. 200 must not be more than two-thirds the fraction passing the No. 40. The fraction passing the No. 40 must have a liquid limit not greater than 25 and a Plasticity Index of not more than 6. These specifications are for crushed limestone.

In a quarry leased by the state, E. L. and Don Kaser set up a complete crushing and screening plant to furnish the aggregate for Harco Construction Co. In the quarry itself they operated an Ingersoll-Rand air compressor and an I-R wagon drill, running the holes to a maximum of about 8 feet. The rock was shot with American Cyanamid ammonia and gelatin base 40 per cent Rock Special dynamite. The limestone was loaded into six quarry trucks by two Speeder $\frac{3}{4}$ and $\frac{5}{8}$ -yard shovels.

The crushing and screening plant regularly produced 1,200 tons of specification crushed limestone per 16-hour day. The quarry trucks dumped into a large crusher feeder which delivered the rock direct to an 18 x 36 Cedar Rapids

jaw crusher, driven by an Allis-Chalmers Model L tractor through a power belt. The crusher-run material was fed directly to a belt conveyor which carried it to the top of a single-deck 1½-inch-opening vibrating screen measuring 4 x 10 feet. This screen is driven separately by an International power unit, a feature of this plant being that each individual piece of equipment is separately driven so that it can be assembled in any possible combination with the assurance that each unit will have its drive conveniently located. Material passing this screen went direct to the storage bin from which it was drawn off into trucks and hauled out to the road.

The oversize went to two chutes with a dividing fin or gate, adjustable so that the flow could be divided as desired between



C. & E. M. Photo
The effective crushing and screening plant operated by E. L. and Don Kaser to furnish aggregate for a stabilized base project on Iowa 184, near Tabor.

the two crushers. The first was a 9 x 36 Diamond jaw crusher which delivered a maximum 1½-inch stone. The second was a Universal hammermill driven at 1,200 rpm and set to deliver a maximum $\frac{1}{4}$ -inch material but at least 95 per cent of which was smaller. The material for

both these crushers was delivered to the same return belt which placed it on the main belt whereby it was returned to the vibrating screen at the top of the plant.

The Diamond crusher is driven by a Wisconsin motor, and the hammermill

(Continued on page 20)

ROPE LIFE LARGELY DEPENDS ON THE OPERATOR

...Yes, even TRU-LAY *Preformed*



While American Cable **TRU-LAY PREFORMED** invariably lasts longer than ordinary non-preformed wire rope, it still is a precision machine made of steel (critical material) and subject to wear. Careful operators can make a wire rope last much longer, while inexperienced ones can quickly ruin it. Make sure your inexperienced operators know how to take care of wire ropes properly. Here are a few fundamental suggestions:

- ★ Inspect, clean and lubricate all wire rope regularly. Tighten fittings. Be sure hemp core is not dry, or corrosion or collapse may occur.
- ★ Be sure the rope is the proper one for the service. It should have proper strength, flexibility, resistance to abrasion, fatigue, crushing and heat. Consult your American Cable representative.
- ★ If drums or sheaves are small, or there is a tendency to whip or kink, specify **TRU-LAY PREFORMED**, the fatigue-resisting flexible rope.
- ★ Be careful of the fleet angle. If the rope deviates from the center plane of the sheave more than 1½ degrees, undue wear will result.
- ★ Don't allow bad spooling on drums. Spaces between wraps, or crossed wraps, cause crushing and binding. **TRU-LAY PREFORMED** spools better than most ropes.

Conserve steel by making your present equipment last longer. Proper inspection, lubrication and maintenance will make long-life **TRU-LAY PREFORMED** last longer.

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C. & E. M. Photo

A Metropolitan District water pipe covered with Johns-Manville insulation is carried across the bridges with pre-cast concrete slabs on the top.

Penetration Macadam On Industrial Route

(Continued from page 1)

penetration macadam the double seal was devised, using a quick-breaking asphalt emulsion and a smaller graded stone to choke the surface. The asphalt emulsion has a Furol viscosity at 77 degrees F. of 50 to 200; and is 55 to 60 per cent asphalt. This was applied at the rate of $\frac{1}{2}$ gallon per square yard at 100 degrees F. in three strips of variable widths. The asphalt broke in from 5 to 10 minutes, depending on the wind and the dampness in the air. After it had broken, changing from its brown to the distinctive black asphalt color, No. 4A stone ranging from $\frac{3}{8}$ -inch to No. 10 was applied at the rate of 10 pounds per square yard by the Buckeye spreader, hand-spotted and rolled by a 12-ton roller. Following this, $\frac{3}{8}$ gallon of the same emulsion and the same crushed trap rock at the same rate was applied and rolled and the road permitted to set until the next day before traffic was permitted on it.

This new penetration macadam uses about $\frac{1}{2}$ gallon less of asphalt in the penetration than in the old Massachusetts B.M.A., the choke stone is smaller, and the seal stone is the next size smaller instead of being the same size as the first choke. This new double-seal penetration macadam rides like a bituminous-concrete pavement but is less expensive. It costs about the same as the older bituminous-macadam pavements of the mosaic-surface type. The 1941 average costs of bituminous macadam and bituminous concrete in Massachusetts were as follows: bituminous macadam 7 inches thick, \$1.12 per square yard; bituminous concrete 6 inches thick, \$1.36 per square yard.

Major Quantities

The major quantities in this Federal-Aid Project 312, A(2)B(2), which was

awarded on a total bid of \$339,695.70, are as follows:

Roadway earth excavation	16,600 cu. yds.
Class A rock (1 cubic yard or larger)	530 cu. yds.
Peat excavation	87,500 cu. yds.
Macadam excavation	1,700 cu. yds.
Bridge excavation	530 cu. yds.
Trench excavation	1,900 cu. yds.
Channel excavation	220 cu. yds.
Class B excavation (trench)	105 cu. yds.
Concrete excavation	21 cu. yds.
Reinforced-concrete surface excavation	360 cu. yds.
Trees removed	45
Ordinary borrow	122,000 cu. yds.
Gravel borrow (average haul, 7 miles)	27,600 cu. yds.
Sand borrow	3,200 cu. yds.
Stripping gravel pits	2,760 cu. yds.
Fine grading, rolling and finishing	18,000 sq. yds.
Crushed-stone base course	11,700 tons
Bitumen, surface treatment (tar)	53,000 gals.
Bituminous-concrete pre-mix (patching of tar road)	1,800 sq. yds.
Bituminous concrete (on bridges)	208 tons
Steel sheeting left in place	126,950 lbs.
Timber piles	7,970 ft.
Timber piles, treated	7,600 ft.
Class A concrete	946 cu. yds.
Steel reinforced structure	248,500 lbs.
Zinc bearing plates	1,411 lbs.
Bituminous damp-proofing	1,290 sq. yds.
Wrought-iron plates	20,000 lbs.
Treated lumber	4.8 MMB
Riprap	2,070 cu. yds.
Rock fill	500 cu. yds.
Field stone masonry	175 cu. yds.
Vitrified-clay pipe, 10-inch	36 ft.
Vitrified-clay pipe, 12-inch	1,020 ft.
Cast-iron pipe, heavy-weight, 12-inch	330 ft.
Cast-iron pipe, heavy-weight, 30-inch	46 ft.
Cast-iron pipe, light-weight, 30-inch	26 ft.
Granite curb	14,750 ft.



C. & E. M. Photo

The texture of the double-seal penetration macadam after several months of heavy traffic.

Preparing the Job

Mass. 107 in the section being rebuilt was an old single roadway 40 feet wide paved with bituminous macadam in rather poor condition and subjected to very heavy industrial traffic. The project includes the construction of two 33-foot roadways separated by a raised medial strip varying from 5 to 20 feet wide and with a sloped concrete curb 7 inches thick on either side of the center strip. The exposed surfaces of the curb were sand-blasted. An old granite curb on the west side of the old roadway between it and the street-car reservation was moved to the east side of the new north-bound roadway, and a 5-foot shoulder but no curb was placed on the west side of the new south-bound roadway. A sidewalk varying from 4 $\frac{1}{2}$ to 7 feet wide was built on the east side of the north-bound roadway, but in short stretches at street intersections on the west side. The sidewalks are of bituminous concrete 1 inch thick laid over

(Concluded on next page)



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depends on power to construct. For stepped-up productive hours from **CONSTRUCTION MACHINERY** use . . .



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These lubricants and Sinclair specialized gear oils and greases safely cushion the hard grind of peak load and overload operation.

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224 So. Michigan Ave., Chicago, Ill.

Mass. Improves Road And Old Structures

(Continued from preceding page)

2½ inches of broken stone penetrated with asphalt.

The contractor started work May 7, 1941, removing peat on the west side of the old north and south highway outside the limits of the old two-track street-car line. The peat was excavated by a Bucyrus-Erie and a Browning dragline and cast out into the marsh beyond the ditch limit or about 45 to 50 feet from the inside of the peat cut. The excavated area was then backfilled by end-dumping about 50,000 cubic yards of stone dust which a local quarry wished to dispose of and about 65,000 cubic yards of gravel to push the muck ahead of the fill. The outer edge of this fill was left with a 1½ to 1 slope over the 1941-1942 winter and then in the spring of 1942 the peat was pulled back on the fill on a slope varying from 3 to 1 to 4 to 1 and the ditch thus formed left to take care of tidal water.

Following this, the old street-car line right-of-way, from which the draglines had operated in excavating the peat, was excavated down to grade, and a layer of gravel 9 inches thick spread and rolled in two layers by the 12-ton rollers. This formed the service roadway for traffic during the reconstruction of the old 40-foot bituminous-macadam highway. The gravel was given two applications of tar at the rate of 0.33 gallon per square yard each time. The first application was a T-3 tar and was blotted with a small amount of sand and the second with stone dust to form a tighter surface. Traffic was then turned on the new tar-surfaced west roadway, except at the bridges, and with the exception of a few breaks it stood up remarkably well under traffic while the old roadway was being broken up by a road roller equipped with spikes in the rear wheels and the new penetration-macadam surface laid over it. The grade of the new easterly roadway was warped to fit the old roadway and there was no excavation except where the new alignment went outside the old roadway and where the old road was too high.

A 1½-foot trench was excavated along the east side of the medial strip and the new concrete curb set. The trench back of the curb was backfilled with gravel and then the balance of the old bituminous macadam back of the curb and in the new medial strip area was excavated and used to back up the gravel backfill at the curb. After the east roadway was completed and the traffic turned on it, the balance of the old macadam from the medial strip was excavated and used as base stone on the west roadway as far as it went.

At the south end of the project, adjacent to the traffic circle where Routes C1 and 107 cross, a considerable area of old reinforced-concrete pavement around the street-car rails had to be removed. The contractor let the breaking of this concrete to the Concrete Cutting Corp. of America, Brooklyn, N. Y. A Lorain 1½-yard shovel and a Lorain 40 clamshell were used on the job for ex-

cavation and for setting riprap around the bridges. In removing some of the concrete around the street-car rails, the contractor used Worthington jackhammers powered by a Worthington portable air compressor. For spreading fill ahead of rolling, a Model K and a Model S Allis-Chalmers tractor equipped with Baker bulldozers were used.

Structures

There were three bridges and one culvert in the contract. Two small bridges were widened on the west side and a new deck constructed on the east side. The deck is of concrete-beam construction and each bridge carries a new sidewalk cantilevered on the east side. A slightly larger bridge on the Revere-Saugus line was rebuilt with creosoted wood pile bents and a concrete-beam superstructure. The single concrete culvert was lined with wrought-iron plate because it carries tidal water.

Personnel

The contract for this 2.33-mile Fed-



C. & E. M. Photo
Existing masonry wells for the trees were raised about 1 foot. Note the bituminous sidewalk.

eral-Aid project for a penetration-

macadam surface with the new double seal using asphalt emulsion was awarded to G. Rotondi & Sons of Melrose, Mass., with Ernest Rotondi as Superintendent throughout the work. For the Massachusetts Department of Public Works, John J. McCarthy was Resident Engineer.

Truck-Mixer Catalog With Operating Data

The recently released 1942 catalog on Rex Hi-Discharge Moto-Mixers describes and illustrates the mechanical features of these units, with complete specifications and operating data. This new bulletin, No. 405, devotes a pair of facing pages to each of the major features which include end-charging, visible mixing, live mixing action, the water system, the unrestricted discharge, the Rex Quint-Spout and the Chain Belt drive.

Copies of this bulletin will be furnished promptly to readers of CONTRACTORS AND ENGINEERS MONTHLY writing direct to the Chain Belt Co., 1666 W. Bruce St., Milwaukee, Wis.

RITECURE

(With temporary color indicator)

The Original Colorless Cure for Concrete

Brings Laboratory Curing Conditions to the Job



CONCRETE FACTS

RITECURE, the original colorless Membrane Cure, was specifically designed for curing concrete by the organization that developed Hunt Process and the Impervious Membrane Method, with which over 50 million yards of concrete have been cured.

RITECURE differs both chemically and physically from other so-called "colorless curing" compounds, in that the



major ingredients are chemically active. Its high moisture retention is the result of the chemical action of the selected ingredients with the concrete surface, which results in the impervious protective membrane unique with **RITECURE**.

RITECURE is quickly saponifiable and, therefore, immediately satisfies the calcium hydroxide always present in concrete. Unlike the inert rosin and wax types which do not react with the concrete, **RITECURE** increases the abrasion resistance and ultimate durability of the concrete surface.

RITECURE will not stain or mottle the lightest shades of concrete. It maintains the natural concrete appearance from time of application to the complete removal of the membrane by oxidation or "chalking." The color indicator aids application and inspection, but disappears entirely as the film dries.

RITECURE will not peel upon exposure to the action of oxygen or air and ultraviolet light, since it owes its toughness to reaction with the concrete itself. The removal, after the curing is completed, is accomplished by gradual oxidation, which starts after the curing period is ended and continues until the coating has completely eroded away, leaving a hard, dense, natural concrete surface of uniform appearance.

RITECURE was not suddenly created to meet a demand, nor offered without adequate experience and background. Instead, its merit was determined years prior to the era of war construction, by thorough and comprehensive tests conducted by major Federal Agencies and other recognized concrete laboratories, as well as by broad field experience. Engineers and contractors know from long and satisfactory experience that they can always depend upon **RITECURE**, the original membranous concrete curing compound.

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A new concrete mixer for off-the-road-work.

New Truck Mixers For Special Service

Designed for off-the-road service, twenty new high-dump concrete mixers have recently been completed for the U. S. Engineers for use in the construction of military roads, airports, and other construction requiring off-the-highway transportation of materials. These units consist of Jaeger 5-cubic yard concrete mixers mounted on Euclid Model 14FD chassis powered by 150-hp Cummins diesel engines.

By removing the mixer unit and making minor structural changes, the chassis can be converted into a standard rear-dump Euclid for hauling earth, rock, or other construction materials over difficult terrain.

Soil-Erosion Control Protects Investment

A very apt comparison which shows the importance of erosion-control seeding, sodding and vine planting on highways is to consider highways and houses in parallel and to look upon erosion-control operations on shoulders, slopes and ditches as the equivalent of the paint which is put on the outside of a house to protect it from the weather in order to keep future maintenance costs on that house at a minimum. The real reason for maintaining anything is to protect the original investment and keep it serviceable with as little added annual upkeep cost as possible.

In discussing this at a Division meeting, Robert C. Ranney, Landscape Architect, Division 2, Ohio Department of Highways, remarked, "To those who yet

believe that erosion-control treatment on vital military-roadway areas still belongs in the peacetime foolishness column, now that we are engaged in war, I can but reason with them thus: Any and all vital military roads that will have to be improved or rebuilt and

widened from now on still will have to be maintained afterwards. And money for their maintenance may become much more scarce than it has been heretofore. If we keep our heads and think rationally, we shall still keep on realizing that fact, and we shall continue such policies during construction as will still give it recognition.

"It is true that already our large automobile manufacturing plants have ceased their output of cars and trucks for private business and pleasure, and are now engaged in building 'jeeps', army trucks, tanks and planes for our war effort. However, paint is still being used to protect the wearing surfaces of these vehicles of war from the ravages of weather, even as it was used to protect the peacetime automobiles and trucks we used. No one would think of that as foolishness. The same thought should be equally applicable in protecting roadway shoulders, slopes, and ditches from erosion, which if left continually unchecked will necessitate a lot of expensive repair work."

New Executive Vice Pres. Appointed at LeTourneau

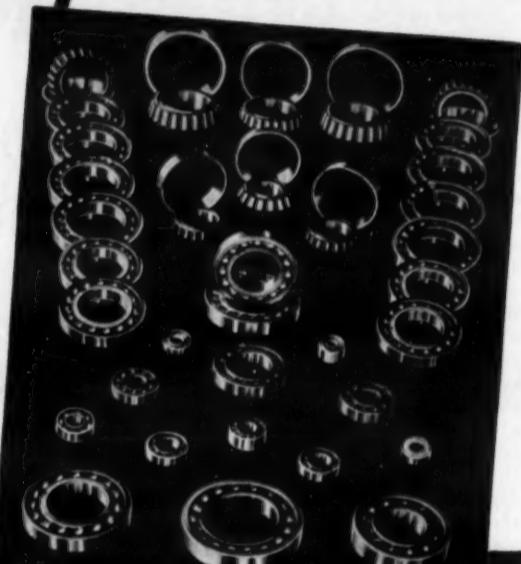
To coordinate the executive activities of the fast-growing LeTourneau company and thereby increase its effectiveness in the war effort, Murray M. Baker of Peoria, Ill., has been appointed to the newly created post of Executive Vice President of R. G. LeTourneau, Inc. Mr. Baker enters on his new duties immediately and will make his headquarters at Peoria.

This new post was created to enable R. G. LeTourneau to devote a greater share of his time to the increased engineering activities made necessary by the war work in the company's four plants in Peoria, Ill.; Tournapul, Ga.; Vicksburg, Miss.; and Stockton, Calif.

Mr. Baker has been associated with earth-moving and heavy construction equipment since 1909 when the Holt Mfg. Co., now the Caterpillar Tractor Co., was first established in Peoria. For the past four years, he has been a Director of R. G. LeTourneau, Inc.

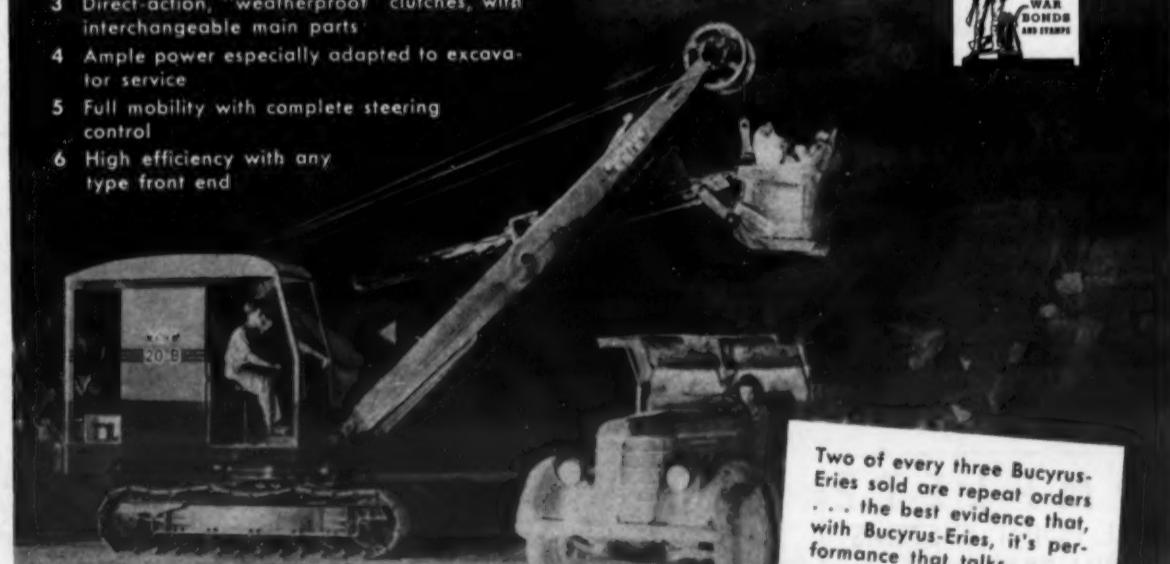
Smoothing the way to OUTPUT

IN $\frac{1}{8}$ -yard, $\frac{1}{2}$ -yard, and $\frac{3}{4}$ -yard Bucyrus-Eries, every power-transmitting part on the revolving frame used in the digging cycle is mounted on anti-friction bearings. This means that not just the drum shafts, but the parts on those shafts as well, run on anti-frictions. That's one of the reasons why maximum power actually gets to the point of action in Bucyrus-Eries, why maintenance requirements are low, why efficient machine life is long, why these machines deliver the sustained output so necessary for war work today.



Check THESE OUTPUT-PRODUCING Bucyrus-Erie FEATURES

- 1 Anti-friction bearings
- 2 Oil enclosed gears
- 3 Direct-action, "weatherproof" clutches, with interchangeable main parts
- 4 Ample power especially adapted to excavator service
- 5 Full mobility with complete steering control
- 6 High efficiency with any type front end



Two of every three Bucyrus-Eries sold are repeat orders... the best evidence that, with Bucyrus-Eries, it's performance that talks.

B-88

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PILE DRIVER HOISTS



A drill jumbo, with four water Leyner drills, on the passing track in Duchesne Tunnel.

Drilling Methods In Duchesne Tunnel

Utah Const. Co. Advances 20 Feet in 24 Hours on Provo Project Tunnel in Northern Utah

By N. L. POPE, Chief of Field Party Bureau of Reclamation

WORK on the Duchesne Tunnel, which will eventually be 6 miles long and convey water from the North Fork of the Duchesne River to the Provo River in northern Utah to provide a supplementary water supply for land placed under irrigation nearly 100 years ago by Mormon pioneers, is advancing at the rate of 20 feet every 24 hours. The eventual cross-section of the tunnel will be horseshoe shaped with a capacity of 374 cubic feet per second unlined and 600 cubic feet per second when lined with 5 to 11 inches of concrete. Excavation is being carried through on a 10-foot 1-inch diameter. To date only 15 per cent of the 1 mile of tunnel excavated stands unsupported, the remainder being supported by 22.5-pound 6-inch H-section steel ribs on 5-foot centers with 3-inch timber lagging in the sides and arch.

Funds available upon completion of surveys, testing and plans, and specifications permitted the advertising of only the lower 3 miles of the tunnel. Eight bids were opened on August 21, 1940, and subsequently the contract for the construction of the tunnel under the direction of the Bureau of Reclamation was awarded to the Utah Construction Co. of Ogden, Utah, on the low bid of \$724,575. The cost of the entire project, including diversion works and a short canal to divert water from Broadhead Creek into the tunnel, is estimated at \$2,100,000.

A force of over 100 men, consisting of four 8-hour shifts and one extra gang, is advancing the tunnel heading. The fourth shift is used as a relief crew for the other three, holding the working time to 40 hours per week with one dead shift. The extra gang is kept busy placing fan line, keeping drain ditches open, cleaning track, and shifting the dump track when necessary. A special timber crew, one shift each day, places lagging behind the 6-inch steel ribs which have been erected by the regular crew follow.

ing mucking operations.

Drilling and Blasting

The initial step in the tunnel operation consists of moving the drill jumbo into the heading and setting up the drills. A round of 35 to 37 8-foot holes, requiring about 2 to 2½ hours work, is drilled by five drillers and five chuck tenders. The drilling requires 150 to 165 pieces of steel per round, depending on the hardness of rock encountered. The drill jumbo is then pulled back to the passing track and the holes loaded with 200 to 250 pounds of 60 per cent gelatin explosives. The lights are moved back about 100 feet from the heading and the wires connected for firing. Firing is controlled by the shift boss at a safety switch about 1,000 feet back from the heading, and after all men are in the clear, the round is fired. Loading the holes and shooting requires about 45 minutes.

Mucking

After shooting, a period of about 30



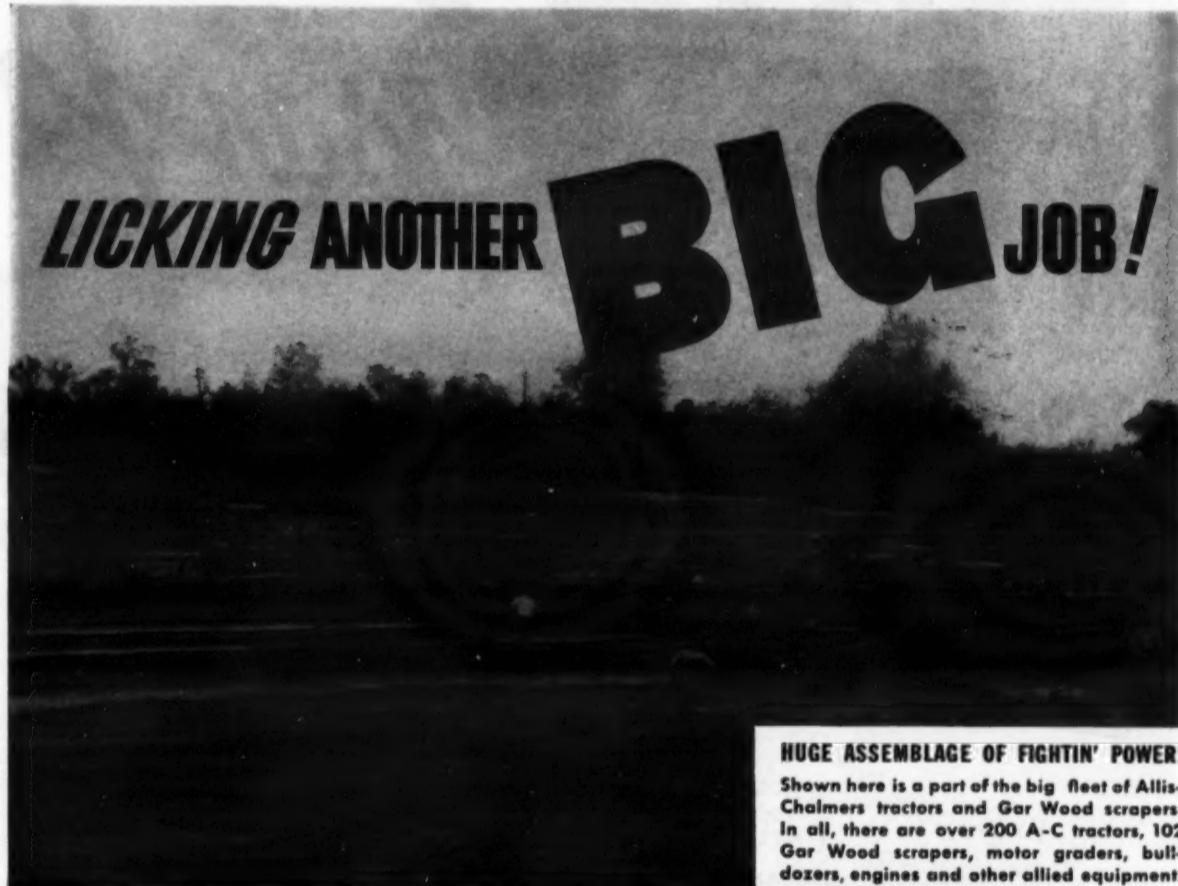
View of the Duchesne Tunnel, looking toward the outlet portal.

minutes is allowed for the powder fumes to be cleared out before the men return to the heading. The mucking machine is then pushed into the heading, lights are replaced, and while the mucking machine clears the track of material shot back by the blast, two miners bar

down all loose rock in the heading. One empty car is coupled to the mucking machine for loading and a second car is picked up by a "cherry picker" hoist and swung clear of the track.

As soon as the first car is loaded, a

(Concluded on page 19)



OVER 200 ALLIS-CHALMERS TRACTORS ON ONE HUGE SOUTHWEST PROJECT

A vast array of mechanized might is winning another race against time, on another ordnance project — one of the largest, perhaps one of the toughest! Faced with a time limit, long hauls and 5 to 6 feet of muck removal before making cuts and fills . . . officials in charge found they needed equipment with plenty of power for the tough hauling, plenty of speed for the long pulls. Over 200 A-C tractors, together with 102 Gar Wood scrapers and other Allied units were rushed in to take over the brunt of the attack. Put on a three shift, 7 day a week basis, they are building mile after mile of road, handling grading for the railroads, laying the groundwork for the buildings! On every project, of every size, at home and on the fighting front — you'll find these mechanical soldiers of war hurrying the day of peace!

HUGE ASSEMBLAGE OF FIGHTIN' POWER!

Shown here is a part of the big fleet of Allis-Chalmers tractors and Gar Wood scrapers. In all, there are over 200 A-C tractors, 102 Gar Wood scrapers, motor graders, bulldozers, engines and other allied equipment.



BORROW PITS GO STRAIGHT DOWN!

The borrow goes unusually deep on this project to save time and money stripping a wide area of the 5 to 6 foot covering of spongy muck. The tough-loading, sandy-clay borrow is heaped-up in the Gar Wood scrapers with the powerful, 2-Cycle Diesel tractors.



Handling by far the greater part of the bulldozing work are 2-Cycle Diesel tractors equipped with Gar Wood and Baker bulldozers.

The Original Bucketrux

Trade **DEMPSTER** DUMPSTER ^{Mark}
Reg. No. 353486

Mfgd. by

DEMPSTER BROTHERS, Inc.
Knoxville, Tenn.

ALLIS-CHALMERS
TRACTOR DIVISION - MILWAUKEE - U. S. A.

Effect of Moistur

In Soil Stabilization

A new bulletin describing the operating methods for stabilizing soils with asphalt cut-back and Kotal which, it is claimed, permits the use of soils running very high in moisture content and eliminates the need for accurate moisture control, has recently been released by Kotal Co., 52 Vanderbilt Ave., New York, N. Y.

This bulletin, which is one of the

series dealing with the various applications of Kotal to bituminous road and runway construction, may be secured direct from Kotal by mentioning this item.

C-P El Paso Office

Moved and Enlarged

Better facilities for repair and larger office and shop space have been provided at the new location of the El Paso, Texas, branch office of Chicago Pneu-

matic Tool Co. of New York City. The former local headquarters in the Mills Building at El Paso have been moved to 515 Texas Street. This change will speed repair work and shipment of parts, according to E. R. Goss, District Manager.

The one-story building has been remodeled to standard company specifications and new equipment has been installed throughout for the repair and maintenance of the full line of C-P pneumatic and electric tools, rock drills, air compressors, etc.

Lessons in Arc Welding

A new booklet, "Lessons in Practical Arc Welding," taken from Part II of the new and complete Hobart text book, "Practical Arc Welding," has recently been published by Hobart Brothers Co., Box CE-52, Troy, Ohio. This book contains the complete series of forty-one arc welding lessons offered at the Hobart Trade School.

As a special offer, this book is available for 25 cents for a limited time.



Conserving Diesels

By Effective Care

Don't Neglect the Factors For Correct Performance: Preventive Maintenance Leaves Nothing to Chance

By RALPH BAKER

IN these days it behooves everyone to conserve equipment by giving it the best of care. At any time, the difference between profit and loss on a job may be a matter of how machines are maintained, especially in regard to power, which in heavy equipment frequently means diesel power. Since diesel engines, contrary to general belief, are very sensitive to certain forms of misuse and to adjustments, it is highly important that they be kept functioning efficiently.

There are four chief factors in correct diesel performance, any one of which, if neglected, will mean trouble. They are (1) maintenance, (2) operation, (3) lubrication, and (4) fuel.

Maintenance

Wherever you find a successful contractor, you will find an efficient maintenance set-up. This means adequate shop equipment, good mechanics, and a definite program which leaves nothing to chance. The object of maintenance should be preventive. Breakdowns in the field are costly, not only in repairs but in lost time. Not all such breakdowns can be prevented, but about 90 per cent of them can be eliminated by correct maintenance. The practice of one successful contracting firm in this regard supplies a good example of what this means.

Once a week all mobile equipment is brought into the shop for a check-up. If serious repairs or an overhaul is necessary, replacements rather than repairs are made. This puts equipment back into service quickly and prevents work from piling up in the shop.

Operators are required to report to foremen anything that needs attention, and field repairs and adjustments are made if needed. Careful records are kept of the down-time of all equipment, which not only gives a basis for judging performance, but a check on operator and shop efficiency.

It is important to know exactly how much down-time you are getting, and if it is too much, who or what is responsible. One contractor, for example, whose average crawler tractor down-time increased from 20 minutes per day to 40 minutes, finally traced the trouble to his head mechanic, who was neglecting the little things that lead to big ones. He handled repairs well, but there were too many of them. It was a case of poor preventive maintenance. Lost time diminished almost at once when the man was replaced.

Constant watch must be kept for defects of all kinds in order to catch them before they become serious. The failure to tighten a loose nut may allow a whole assembly to collapse, or a housing to be destroyed.

In the field, dust probably causes more diesel trouble than any other one thing. It attacks rings, pistons, and cylinder walls. A neglected air cleaner, a leaky gasket, and damage starts—inside, where it cannot be seen readily. Undue wear on the top ring is a pretty sure indication of dust, and nine times out of ten is caused by neglect of the air cleaner. Air-cleaner bowls should be cleaned according to dust conditions. When dust is bad, as it is on most construction jobs, once a shift is not too often.

Operation

Ordinarily diesel-powered equipment is not usually operated by the owner but by men who may know their diesels, but who in many cases know only how to

run them, and who at best cannot be expected to have the same interest in the equipment as the owner. No machine is any better than its operator, and it pays to be constantly on the alert to maintain good operation, correct faults, and weed out individuals who do not measure up.

The practice of holding short classes in instruction for operators has been carried out successfully in a number of instances, and some such plan is to be recommended. Oral or printed instructions, "do's" and "don'ts," are always advisable, such as the following:

1. Don't run your diesel with the jacket temperatures below those recommended by the manufacturer or you won't get proper fuel combustion.
2. Don't wait until your engine is overheated before you fill the radiator.
3. Don't let your oil run low; check it at least once a shift.
4. Watch your fuel supply; you waste time if it runs out on the job.
5. A good operator does not clash gears in shifting.
6. A quick way to spot a poor operator is to watch for rough jerky handling.
7. You wouldn't race your engine at high speed without oil, would you? Then don't race a cold engine.
8. Slow down on rough ground. We're not in that big a hurry.
9. Overloading means trouble. You may save a minute now in a higher gear, but a lower one will save hours later in the shop.



Careful laboratory and field tests are constantly being conducted by equipment manufacturers and oil companies to determine the best fuels and lubricants for each type of diesel. Here technical experts are examining a piston after a grueling field test run under actual operating conditions.

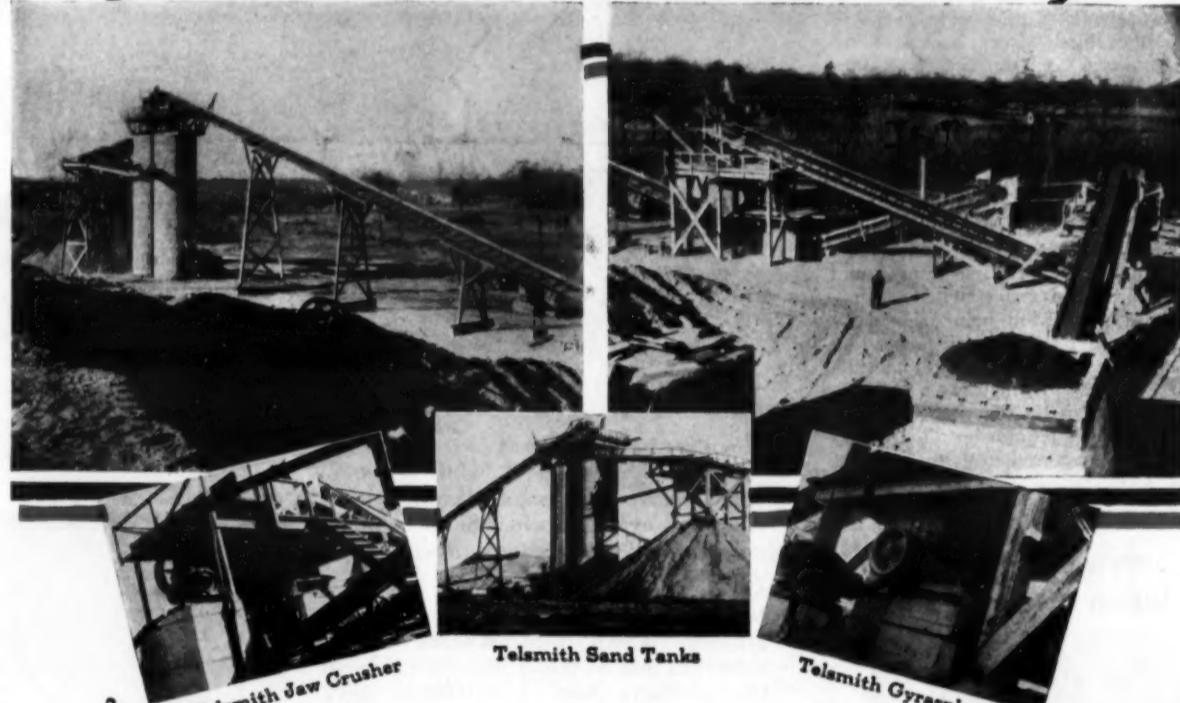
10. A good operator is one who makes money for himself and for the boss; for the boss by keeping his rig in good shape; for himself by keeping his job.

(Continued on page 48)

TELSMITH Gravel Plant

goes all out

FOR WIN-THE-WAR CONSTRUCTION



★ Minus and plus $\frac{3}{4}$ " and minus $1\frac{1}{2}$ " gravel, and sand is in demand for war projects in the vicinity of Pawtucket, R. I. Starting operation Nov. 1, 1941, this new Telsmith equipped gravel plant of J. J. McHale & Sons near Pawtucket is turning it out at about 125 to 150 tons per hr.

A $1\frac{1}{4}$ cu. yd. shovel and two end dump trucks feed raw bank run gravel into an 8 cu. yd. hopper having a railroad rail grizzly that rejects the few oversize boulders. A $30'' \times 5'6''$ Telsmith Reciprocating Plate Feeder feeds material out of hopper and over a No. 450 Telsmith Rotary Grizzly with $3\frac{1}{4}$ " spaces. Plus $3\frac{1}{4}$ " goes to an 18×30 Telsmith Roller Bearing Jaw Crusher. A $30'' \times 73'$ belt conveyor takes minus $3\frac{1}{4}$ " direct from the grizzly, and from the jaw crusher, to a $4' \times 10'$ Telsmith Single Deck Pulsator.

Plus $1\frac{1}{2}$ " from this scalping screen goes into a No. 36 Telsmith Gyrosphere Crusher; and when crushed returns to the $30''$ primary conveyor via an $18'' \times 48''$ conveyor.

Minus $1\frac{1}{2}$ " from the scalping screen goes via a $24'' \times 186''$ finished product conveyor to a $5' \times 12'$ Telsmith 2-Deck Pulsator for washing and sizing. Sand is flumed to two No. 8 Telsmith Sand Tanks on a tower independent of main plant. The two sizes of gravel are deposited in two $20'$ diam. concrete-block silo bins, fitted with bin gates for loading into trucks.

Why do so many operators with war construction jobs depend on Telsmith? Because Telsmith equipment can be pushed to top speed and will produce. Telsmith Engineers' plant planning is sound. Telsmith Service is fast. Get Bulletin G-34.

6-10

SMITH ENGINEERING WORKS, 4014 N. HOLTON STREET, MILWAUKEE, WISCONSIN

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Charleston Tractor & Ept. Corp. Roanoke Trac. & Ept. Co. North Carolina Ept. Co. Wilson-Werner-Wilkinson Co. Charleston, W. Va. Roanoke, Va. Raleigh and Stateville, N. C. Knoxville and Nashville, Tenn.

G. F. Seeley & Co. Toronto, Ont.

STERLING
LIGHT PLANTS

BUILD FOR DEFENSE with STERLING PUMPS HOISTS and LIGHT PLANTS

STERLING MACHINERY CORP.

405-11 Southwest Blvd. Kansas City, Mo.

Well-Kept Stockroom Features County Dept.

(Continued from page 2)

of passenger-car chains for winter use, spark plugs and general automotive supplies. Against the wall a single line of bins contain bolts, nuts, washers and cotter pins of every imaginable size, while one other pair is devoted to all sizes of cap screws.

We have now reached the end of the room and turn to view the assembly of storage devices along the east wall. Hanging along the wall at the north end are assorted sizes of radiator hose and fan belts and then a large cabinet with a tool board on top on which special tools for special work are mounted. Beneath the tool board and tool cabinet is a cupboard for oils and other fluids, nail bins for dispensing small amounts of nails, a bin devoted to miscellaneous tractor tools, and then a very neat and workman-like set-up of shallow drawers containing drills, dies, taps, micrometers, valve-reseating tools, etc., and 15 drawers devoted solely to gaskets already cut to fit special machinery. These drawers are all built with Celotex bottoms and a sheet-metal frame.

Next, adjacent to the stock man's desk, is a rack of 160 screw-top jars for small brass parts, rivets, etc., and in the bottom section for small steel parts. At the right of the doorway leading out into the general office is a heavy pipe rack, holding six 55-gallon drums, one each of creosote, linseed oil, hydraulic oil for jacks, Carbonite, Zerone, and turpentine. Adjacent to this is a heavy rack of 2-inch pipe, built rectangular in shape, for storing the pipe stakes which are used for marking lot boundaries and iron pins used for the monuments. Completing our clockwise tour of the stockroom brings us to the rag bin adjacent to the door from the unloading room.

Nothing enters this room for storage without going on the perpetual inventory card for that material or part, and nothing is taken from the stockroom without a requisition being signed by the mechanic or truck driver needing that material or part. All parts and material removed from the room are charged through the requisition system to the piece of equipment or job on which it is to be used so that a constant check is kept on the cost of maintenance.

and operation of every piece of equipment owned by the county.

Repair Shop and Storage Garage

The shop, which runs at right angles to the stockroom and offices, measures 96 x 60 feet and is entered through an overhead door from the outside, and also by a large sliding door between the shop and the 112 x 60-foot storage garage. Between the garage and the repair shop on one side is a large lavatory and locker room with showers for all employees and opposite it a wash rack for equipment with a large over-head door opening direct into the yard.

Within the repair shop proper is a welding room with a sliding curtain and a Buffalo Forge Co. suction fan in the roof to draw out the fumes. In here an Oxweld acetylene portable generator is used, a Hammett stationary electric welder and a Lincoln portable arc welder. At the time of our visit the Kerwick automatic-control portable cleaner for removing grease and paint from equipment was temporarily rolled into

the welding room which was not in use at the time.

Opposite the welding room is the machine shop containing a Manley hydraulic press, a 10-foot Monarch lathe, a Hardie-Kellogg high-pressure car washer in the adjacent wash rack, a brake band riveter, an electric tire patcher, a Bear wheel aligner, a Sioux valve grinder and complete accessory equipment, all located behind a heavy wire screen welded to pipe supports and with a sliding gate, all made right in the shop.

On the north wall is the blacksmith shop, with a forge and anvil, a power hacksaw, a Canedy Otto drill press, a Little Giant 100-pound power trip hammer, a Black & Decker power grinder and a Badger State power shear and punch.

At the west end of the shop are a number of repair stalls for equipment, with a monorail running along the entire line with one Yale 2-ton chain hoist and another 1-ton hoist. A unique feature of the shop is the six flexible metal pipes attached to a suction fan and spot-



C. & E. M. Photo
L. W. Weaver, County Engineer, Lancaster County, Nebr., confers with C. J. Neville (left), Storekeeper at the County's Central Garage.

ted all over the ceiling of the shop for slipping over the exhausts of equipment being repaired, especially in winter when the shop is closed, for the removal of exhaust gases and particularly carbon monoxide. By means of this device, engines can be tested indoors in winter.

(Continued on next page)

Equipment In L

(Contin

when it is n and doors c

Along the bench grind of different kit for each floor is a 5 for lifting and wheels.

The pers the Shop F machinist a

A long s 206 feet is the yard alc stalls which

Stall 1 WPA c
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No. 10, 11, 12
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1 Special stor oil barrels, storage for
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3 Storage for mescanes tires which
4 Storage for one true
5 Storage for hoist, guard
6 Storage for up, frenes
7 Two large V rotary plow
8 & 9 are us special arch
for concrete

At the c age is p bridge lus hoist wh loading, tanks, wh Engineering gallons o are also cement a houses the tank cars

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A ver levied o amount of the n operation

NEXT WINTER'S BLIZZARD is Today's problem



...order
WALTER
SNOW
FIGHTERS
now!

When the blizzard strikes next winter, will you be caught "too late", with "too little" snow removal equipment? It will be more vital than ever to prevent blocking transportation of war products, troops, guns, tanks and supplies.

NOW is the time for highway officials to prepare. Equip with WALTER SNOW FIGHTERS and be ready for winter's worst! The exclusive Four-Point Positive Drive provides FOUR powerful driving wheels with positive traction in each, to blast through the deepest drifts—to travel icy surfaces—to keep going when other trucks give up.

Don't wait for the first snow. Study your needs NOW. Write today for full facts on Walter Snow Fighters.

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Above: Walter Snow Fighter on night duty, clearing Pennsylvania Highway.

...
Below: A few of the 40 Walter Snow Fighters serving State of Oregon.



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THE **HERCULES** *IRONEROLLER*

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an *IRONEROLLER* road is recognized by its smoothness.

Combination: Tandem—Three-wheel—Grader—Scarifier

6 to 12 Tons—Gas or Diesel

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HERCULES
COMPANY
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Equipment Storage In Lancaster County

(Continued from preceding page)

when it is necessary to keep all windows and doors closed.

Along the benches are a small Sioux bench grinder, three Sioux electric drills of different sizes, and a separate steel kit for each mechanic's tools. On the floor is a 5-ton Manley hydraulic jack for lifting trucks for the repair of axles and wheels.

The personnel of the shop consists of the Shop Foreman, one blacksmith, one machinist and five mechanics.

The Storage Sheds

A long storage shed measuring 32 x 206 feet is located on the south side of the yard along U. S. 6. It contains eleven stalls which are allocated for the following purposes:

Stall 1 WPA office
Stall 2 Storage for four dump wagons
Stall 3 Storage for four tank wagons
Stall 4 Storage for one motor grader, one tractor and one 2-wheel pile trailer
Stall 5 Storage for four tractors
Stall 6 Storage for one elevating grader, one power grader, one pulled grader, a tractor and a fuel tank
Stalls 7, 8 and 9 each have the same equipment stored as No. 6; No. 10, storage for two tractors, and 11 is a steel bending and structural-steel fabricating shop.

The west shed starts at the west end of the stockroom and really takes off from the furnace room. Its first stall contains oil storage at truck-body height for the easy unloading and loading of oil drums. Adjacent to this is the paint shop in which a new compressor and spray gun have been installed, with suitable ventilation for work on signs in winter. During the summer the outfit is mounted on a truck and the paint man goes out to work on bridges. From this point south are nine storage stalls used as follows:

1 Special storage for old grader blades, old used empty oil barrels, bin for blacksmith coal, a junk bin, and storage for one truck;
2 Has a mezzanine with locked compartments for the storage of grader-outfit tools and, on the ground, storage for a sand spreader and one truck;
3 Storage for three old Thirty tractor cabs on a shelf or mezzanine and below this a rack for storing spare old tires which still might be used if necessary, and storage for one truck;
4 Storage for a 4-wheel trailer with a Novo engine and hoist, guard rail cable and one truck;
5 Storage for two power mowers on Model A Ford pickups, frostee plows, a power pump for supplying water to bridge construction outfit, and concrete carts;
6 Storage for V-type snow plows which Lancaster County does not paint but keeps in excellent condition with a special glass which prevents rust, and two dump wagons;
7 Two large V-plows, two dump wagons and one unused rotary plow unmounted;
8 & 9 are used for the storage of reinforcing bars and special arch forms for stone bridges and plywood panels for concrete bridges.

Open Storage

At the east end of the yard, open storage is provided for such materials as bridge lumber, piling, culverts, a stiffleg hoist which comes in very handy for loading, three 11,000-gallon gasoline tanks, which are necessary as the County Engineering Department used 216,659 gallons of gasoline in 1940. In this area are also small sheds for the storage of cement and small lumber, while a third houses the gasoline pump for unloading tank cars into the three county tanks.

A concrete apron outside the stockroom assures good traction for equipment coming to the shop. On the apron is the gasoline dispensing pump for all equipment based at the Central Garage.

Organization and Financing

Lancaster County covers an area of 864 square miles and has 1,500 miles of county highways, there being no township highways as these are all included in the county system. The County Engineer is an elective officer, being elected as County Surveyor for a four-year term. The state law provides that he shall be ex-officio County Highway Commissioner or County Highway Engineer.

A very small tax of 0.023 mill is levied on real estate for a bridge fund, amounting to about \$25,000 a year. All of the remainder of the funds for the operation of the Engineering Depart-

ment of the County comes from the state gas tax and automotive license fees. Nebraska has a 5-cent gas tax of which 1½ cents goes to the counties. This is divided as follows: 10 per cent to cities and towns, 20 per cent to the county bridge fund, and 70 per cent to the county highway fund. The automotive license fees are divided: 30 per cent to the state highway department and 70 per cent to the county highway fund. Both the gasoline and automotive vehicle taxes are pro-rated throughout the state in accordance to the ratio of motor vehicles in the county to the total number in the state.

Lancaster County has 23 maintenance districts and 17 patrol stations, all built and owned by the county. Each district has one motor grader operating in it. A patrol station may house one or two patrol graders and eight of the stations also house a district maintenance outfit. There are eight such outfits, each of which covers three townships and comprises one crawler tractor, one 10-foot

(Concluded on page 45)

"Installed Quicker, Cheaper and More Accurately

than any other types we have ever used, and we have used large quantities of most of them."—Johnson, Drake and Piper, Contractor.



Dowels and Dowel Assemblies for Expansion Joints in Concrete Paving.

W. S. GODWIN CO., Inc., BALTIMORE, MD.



-BUT THEY ARE NOW!

Like the hundreds of thousands of sturdy American boys whose mothers never dreamed they would be called upon to wear khaki and carry guns in a conflict for world freedom, the Marmon-Herrington All-Wheel-Drive converted Ford

trucks shown here, were originally designed and built for the services of peace, rather than for war.

Built to carry oil scouts and seismograph crews across country, uphill and down, through desert sands and marsh mud; to build and maintain roads; to battle snow drifts; to haul logs from forests; to set utility poles and string wire over mountain, valley and stream—these are the jobs for which they were

intended, and which thousands of their "brothers" are doing every day.

But now, with only few changes, and painted olive green, they are pulling field guns, carrying cargo, and hauling soldiers to battle fronts all over the world. Having all four or all six wheels driving, with as many as eight forward speeds, they give breadth of range and mobility unobtainable in any other type of vehicle in military service.

Marmon-Herrington vehicles have "joined up" 100% for service to the United Nations. The ones you have, which are "too old to fight" must keep our vital home defenses ready for any emergency. Keep them fit, and pray, with us, that an early Victory will make others available for your service. We are doing everything we can to speed the day.

M A R M O N - H E R R I N G T O N

All-Wheel-Drive

M A R M O N - H E R R I N G T O N C O . , I N C .

INDIANAPOLIS, INDIANA

Cable Address: MARTON

Cold Patch Stockpiled For Emergency Repair

Minnesota Develops New Patching Material for Bituminous Roads; Easy To Use in Cold Weather

♦ A WINTER patching mix which may be used during freezing weather for emergency repair work on bituminous roads has been developed by the Minnesota State Highway Department and was used during the 1941-1942 winter season with excellent results in the sixteen maintenance districts of the state. This new patching mix is comprised of graded aggregate, SC-2 oil and powdered asphalt.

The fluid types of binder, made with light grades of MC or SC oil and heretofore used for emergency bituminous repair work, did not have the cementing strength necessary to bond the aggregate into a stable pavement. This fluid type of binder had been used in Minnesota mainly because it was necessary to stockpile the patching mixture along rights-of-way where failures might be expected during early spring thaws. It had been the practice to load and spread the mix even when the temperatures stood as low as zero.

The objections to the old patch mix were many. It was slow in setting after being placed; it was easily displaced by traffic; and inevitably it raveled, making the patch unsatisfactory. When more viscous binder was used to overcome these troubles, the result was a stiff mix unworkable in cold weather.

Research Produces Material

Determined to discover a cold-patch mix material that would be workable at temperatures as low as zero and which could be compacted into a firm patch, C. L. Motl, Maintenance Engineer for the State Highway Department, went to work along with Professor F. C. Lang of the Highway Department Testing Laboratory and J. C. Robbers, M. Brataas and M. L. Jones, Highway Department District Engineers.

The engineers first noted that patching mixtures made of graded aggregate, SC oil and powdered asphalt used in repair work during the regular construction season seemed to be more workable from stockpiles during spells of low temperature than other types of patching mixes. Using this as a starting point, the field, laboratory and central office of the State Highway Department worked out the following specifications for a cold-patch mix for winter repair work:

GRADATION OF AGGREGATE

Passing	Per Cent
5/8-inch Sieve	10
1/2-inch Sieve	65-95
3/8-inch Sieve	35-55
No. 10 Sieve	35-55
No. 20 Sieve	23-40
No. 40 Sieve	13-30
No. 200 Sieve	0-7

BATCH MIX FORMULA

Aggregate	Per Cent
SC-2	94
Powdered asphalt	4
	2
	100 per cent

The mixing time is 70 seconds with the temperature of the mix as dumped

THOMPSON CONSTRUCTION MATERIALS & EQUIPMENT

CONCRETE CURING MATERIALS

- Hum Process
- Ritecure
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- Salt Hay
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- Asphalt
- Cork
- Wood
- Rubber Latex

Write for complete literature and prices

THOMPSON MATERIALS CORP.

Sales Office: 204 West St., N. Y. General Office: 302 Cortlandt St., Belleville, N. J.

in trucks 90 degrees F.

Preparing the Cold Patch

The mixer is charged with the coarse aggregate, sand and filler and mixed for 15 seconds. The SC-2 oil is added and mixing continues for 30 seconds, after which the powdered asphalt is added and mixing continued for 15 seconds. The mix is then dumped into trucks and stockpiled throughout the maintenance districts. Stockpiles remain workable throughout the winter and the mixture satisfactorily compacts and forms a bond with the pavement. This cold-patch mix does not displace under traffic nor does it ravel.

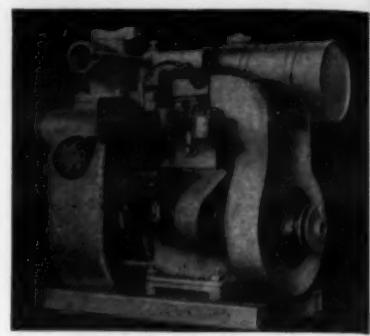
Each of the sixteen maintenance districts in Minnesota has been furnished with a specially built aggregate drier

for use in preparing the cold-patch mix. The aggregate drier was designed by the State Highway Department and built to their specifications by the Moorhead Machinery & Manufacturing Co. at a cost of approximately \$800 each.

New A.I.S.C. Manager

Due to the increasing problems facing the steel industry, which have been produced by the war and are likely to be intensified by the peace, and in view of the resulting increase in work, the Board of Directors of the American Institute of Steel Construction has appointed L. Abbott Post of New York City to the newly created position of Manager of the Institute. This appointment does not otherwise alter the staff in personnel or functions, all of which are continued.

Mr. Post, who was Vice President of Post & McCord, structural-steel erectors of New York City, has for the past year been attached to the Construction Branch, Production Division, War Production Board, Washington, D. C.



2" High-Pressure Pump

Light weight, high-capacity, self-priming

Delivers 65 gallons per minute against 50 lbs. pressure, or 50 gallons per minute against 65 lbs. pressure. Suitable for jetting piles, supplying water to concrete mixers through long pipe lines against high pressure.

Ask for bulletin describing high-pressure pumps.

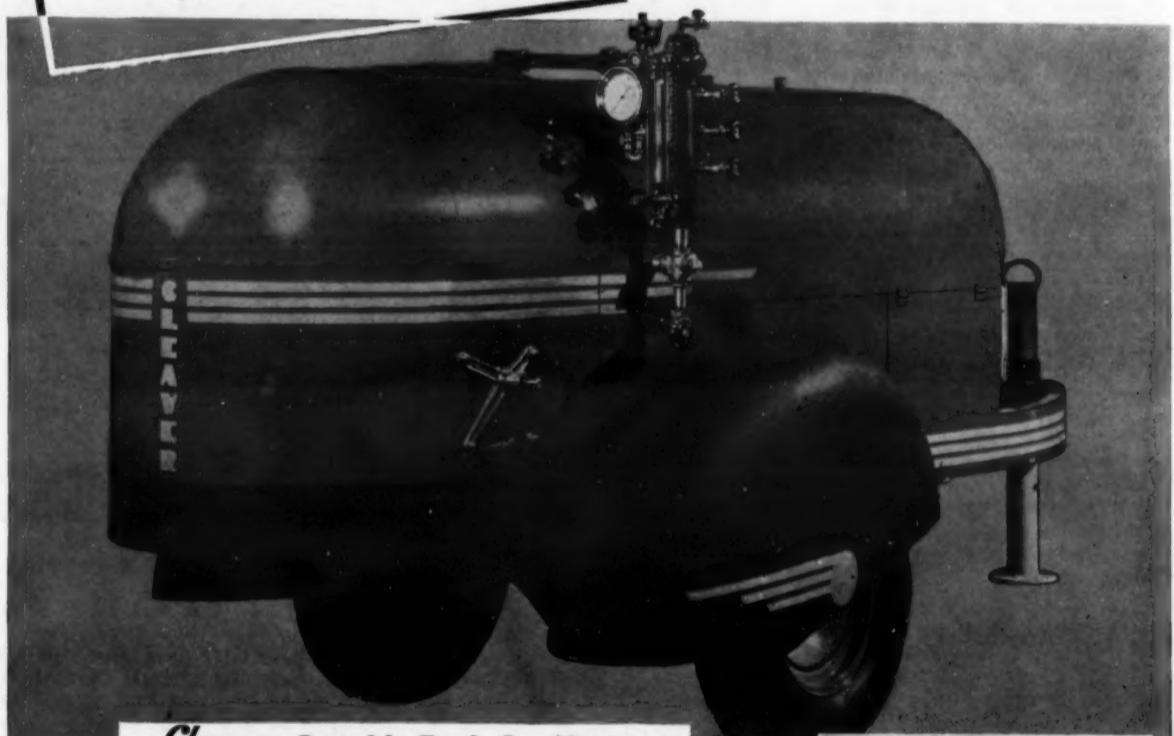
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MARLOW PUMPS

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...THE BEST KNOWN NAME IN HEATING EQUIPMENT FOR BITUMINOUS MATERIAL IN TANK CARS AND STORAGE TANKS



Cleaver Portable Tank Car Heater

The Cleaver Portable Tank Car Heater — a high pressure, oil-fired, compact and mobile heater available in two and three tank car sizes. Famous Cleaver design boiler with four-pass flue travel assures most economical operating costs. Turbine type condensate return system operates without loss of water from car coils.

Tank car heaters and bituminous boosters were pioneered by Cleaver — hundreds of them are in nation-wide use today. Their superior performance is achieved through the original, exclusive Cleaver four-pass, down-draft flue travel and integral burner construction.

When you need to heat — circulate — pump all grades and kinds of bituminous materials in tank cars or storage, there is a Cleaver Tank Car Heater or Pumping Booster to do the job faster, with substantial savings of fuel, time and money. Write for complete information.

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Cleaver Portable Pumping Booster

Cleaver Portable Pumping Booster — withdraws pumpable bituminous material from car — heating by direct firing to application temperature in one operation. Raises car temperature 50 degrees per hour. Available in three sizes — on truck mounting or 4-wheel trailer.

Pioneer Builders of Heating Equipment for Bituminous Materials in Tank Cars and Storage Tanks . . . Cleaver Heaters and Boosters . . . Aggregate Heaters and Dryers . . . Cleaver Automatic Steam Plants

Methods of Drilling On Utah Tunnel Job

(Continued from page 13)

battery locomotive pulls it back past the "cherry picker" and the second car is dropped to the truck for loading. When 10 cars are loaded, the first locomotive pulls to the dump and the second completes the clean-up with 5 to 10 cars. By the time the clean-up has been made, the first locomotive has returned from the dump, changed batteries if necessary, and is on hand to haul material and switch the mucking machine and drill jumbo. The mucking operation requires about 3 hours. Steel supports are placed immediately after the mucking operations. This makes a complete cycle, or one round, about every 8 hours and nets 7 to 7½ feet of tunnel.

Once every 24 hours, when the drilling operations are in progress, a Bureau of Reclamation survey party projects line and grade ahead, cross-sections the unsupported reaches, and paints all tight spots for trimming. Two men work behind the drill jumbo with a jackhammer, when required, to drill tight spots, which are loaded and shot at the same time as the heading.

Well-Equipped Job

The tunnel-driving equipment consists of one drill jumbo equipped with five Gardner-Denver water Leyner drills; a 1/4-yard capacity Eimco-Finlay air-powered mucking machine; two 8-ton General Electric battery locomotives which haul 10 to 70-cubic foot side-dump cars; and one shop-made hoist mounted on a crawler tractor. The hoist is used for hauling cars up the steep grade to the dump. The air-powered hoist or "cherry picker" is used for switching cars in the heading.

A permanent side track of sufficient length to pass a 10-car train has been laid 1,500 feet back from the heading, which is also used for passing the drill jumbo and mucking machine.

Compressed air is supplied by five compressors. Ventilation is supplied through a 22-inch diameter welded-joint fan line by two reversible-type fans, each having a rated capacity of approximately 2,600 cubic feet of air per minute under a pressure of 1 pound per square inch. Each fan is powered by a 30-hp electric motor.

As the nearest available electric power is approximately 25 miles from the tunnel portal and the cost of transmission lines and transformers was considered prohibitive, all power is developed on the job. Electric power for tunnel and camp lighting and for the operation of the ventilating fans and small electric equipment is supplied by two generators, one having a 75-kw capacity and the other a 60-kw capacity, producing 440 volts. The two are synchronized and connected on the same line. The generators are powered by one 125 and one 110-hp Caterpillar diesel engines.

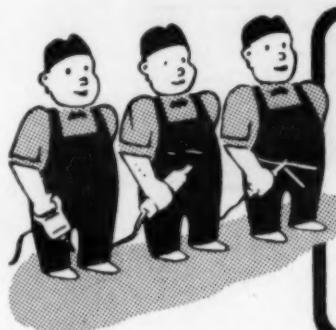
Artials and illustrations, courtesy of Bureau of Reclamation, U. S. Department of the Interior.

Paving Brick Sizes

Reaffirmed Once More

In 1921 vitrified paving brick was available in sixty-six different stock sizes. Simplified Practice Recommendation R1-40, Vitrified Paving Brick, originally reduced the variety to eleven, and the first revision conference further reduced the number to seven sizes. After a total of 10 revisions the stock sizes were reduced to five.

The Permanent Committee of the paving brick industry in its recent survey found that 75.3 per cent of the total shipments during the calendar year 1941 were of the five stock sizes recommended. The Recommendation has again been reaffirmed without change.



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Take Advantage of This Complete Parts and Repair Service
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PREFORMED TOURNAROPE—Made by LeTourneau especially for cable-operated, tractor-drawn equipment. Standard for original and replacement use on LeTourneau equipment.



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SHOP AND FIELD SERVICE FACILITIES—Many LeTourneau—"Caterpillar" dealers are equipped with portable welding outfits, track pin presses and repair cranes to provide quick complete service in the field. All have adequate shop facilities.



JOB PLANNING—Ask your LeTourneau—"Caterpillar" dealer for job layout and estimating help, field engineering figures and facts, and time saving short-cuts.



PROPER BEARINGS—LeTourneau selected and approved bearings for all LeTourneau units.

EXPERT SERVICE—Your LeTourneau—"Caterpillar" dealer has a corps of experienced servicemen trained in efficient, time-saving repair practice. Traveling factory service schools keep them up-to-date on the newest methods.



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TO KEEP BOTH OLD AND NEW OPERATING PROFITABLY, USE LETOURNEAU—"CATERPILLAR" SERVICE

Preparing the Base For 6-Mile Iowa Job

(Continued from page 9)

by a Hercules 165-hp diesel power unit through a Twin-Disc clutch, and 10 V-belts. The secondary or return conveyor is driven by a LeRoi power unit. In order to maintain the efficiency of the hammermill, Kaser has a portable Lincoln arc welder which he moves up to the hammermill once each day to rebuild the hammers with a hard-facing Abrasoweld welding rod. In this way, the production of the correct proportion of fines is assured at all times.

Subgrade Preparation

Under another contract, this job was graded in the spring of 1941 with a 36-foot top, a front slope varying to a maximum of 2 to 1 and backslopes of 2 to 1. A number of wet spots were located in the subgrade after the grading had been completed, so the contractor for the stabilized base scarified the entire roadway between foreslopes for a depth of 6 inches and compacted it to at least 95 per cent of Proctor density. In addition to this, there were 7,800 linear feet of special compaction areas in which the soil was excavated, conditioned, replaced and compacted to at least 95 per cent of Proctor density for a depth of 1 foot.

Windrowing

The crushed limestone was hauled in from the quarry located about one mile west of the west end of the job and placed in a windrow down the center of the road at the rate of 4,500 tons per mile, to make the 6-inch stabilized base. In order to prevent the complete closure of the road to local and cross traffic, spaces were left in the windrowed material at cross roads and at farm entrances so that farm vehicles could use the right side of the road and cross to the left side to enter the farm driveway if necessary. The windrow averaged 4 feet high, so that it would have been rather difficult for a vehicle to cross it without being caught amidships.

Mixing and Rolling

For a single mixing operation the contractor usually took windrows from 1,200 to 1,400 feet long. The most satisfactory and economical operation was to use windrows between 1,000 and 1,200 feet in length, but since Iowa specifications require that "compaction once begun shall be continuous until the final surface rolling has been completed and the finished surface is generally free from loose material," it was sometimes necessary to cut the length to as little as 600 feet. The rolling time usually took about 24 hours after the material was laid down and mixed.

The mixing was done by a single Caterpillar No. 12 power grader which first spread the material and then was followed immediately by a McCormick-Deering field cultivator with wide spades pulled by a McCormick-Deering 15-30 tractor. Immediately following this, 1,000-gallon water trucks sprinkled the material as the mixing was continued,



C. & E. M. Photo

Limestone, crushed to specification, windrowed down the center of Iowa 184, awaiting spreading to make the 6-inch stabilized base.

adding sufficient water to bring the base material up to its optimum moisture, which ran from 7 to 9 per cent. As the material reached its optimum moisture, it was spread to the full 24 feet of the base course on top with a 1 to 1 shoulder at either side, making the bottom

width 26 feet. As soon as spreading to the full width began, Bros sheepfoot rollers compacted the material from the base up, with the blades following the sheepfoot rollers and filling the holes. Finally, as the sheepfoot rollers walked out of the material, Bros pneumatic roll-

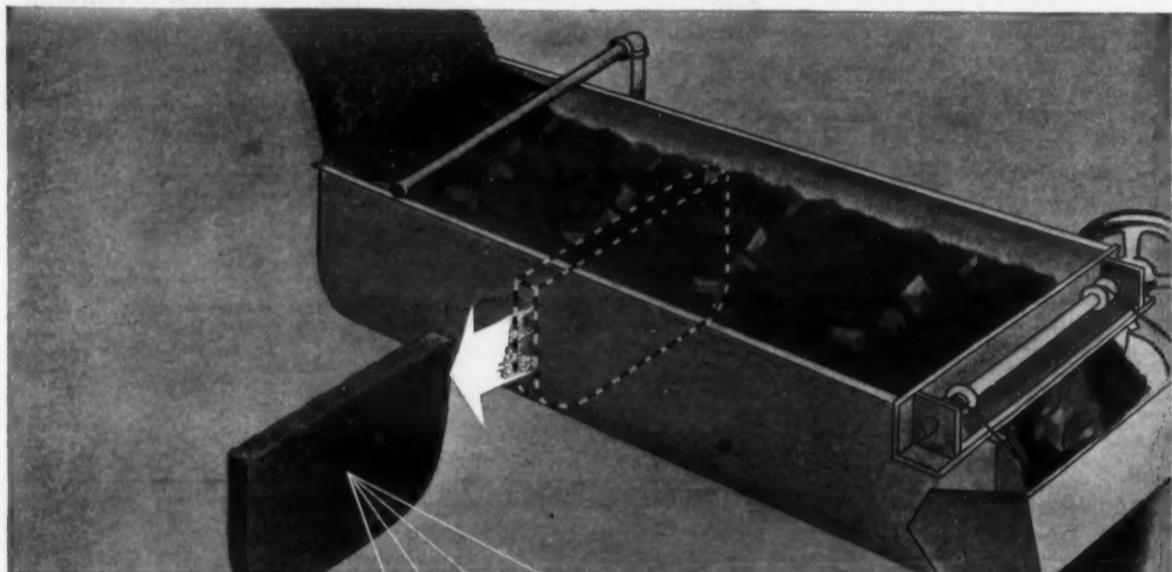
ers were put on to compact the surface, and the polishing operation was rolling by a 5-foot diameter x 6-foot long Bros single steel roller.

Water for the three sprinkling trucks was secured from a stream in the middle of the job where a 2-inch and later a 4-inch Gorman-Rupp gas-engine-driven pump was set up adjacent to the stream, delivering the water to an overhead hydrant so that it could be put into the trucks conveniently. To save the trouble of walking down to the water's edge again, a matter of about 25 feet, the truck drivers arranged a string attached to the switch so that by pulling it the switch was cut and the pump stopped. It was still necessary to go down to start the pump each time.

Shoulder and Base Prime

Before any priming was started, the base and the 5-foot shoulder were thoroughly cleaned by a Hough rotary broom driven by a Wisconsin motor and pulled by an Allis-Chalmers farm pneu-

(Concluded on next page)



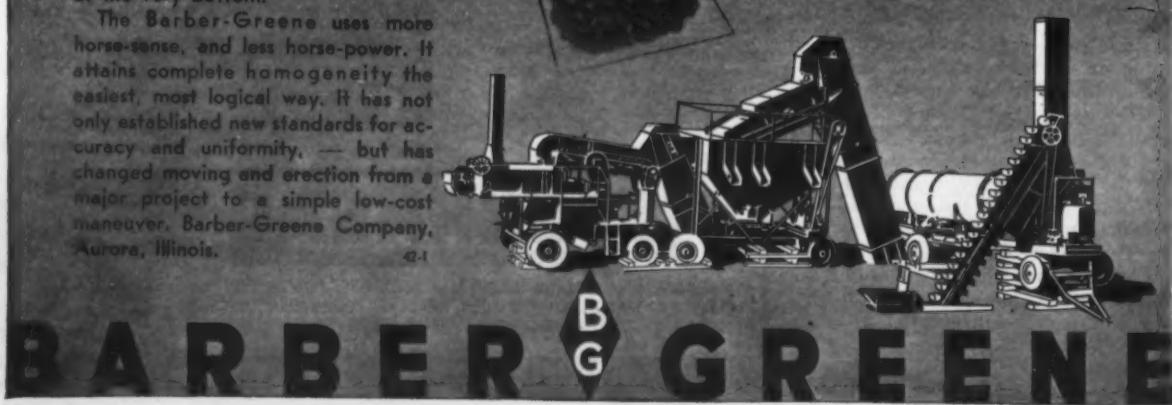
Continuous Mixing

Why did Barber-Greene build a continuous mixer instead of the conventional intermittent batch type? The answer is in the diagram of the Barber-Greene shown above. At the upper left, the graded, and accurately measured aggregate continuously enters the pugmill in a small stream. In entering, it falls through the spray chamber where it is continuously sprayed with a small stream of metered bitumen. The combining process has started, even before the materials enter the pugmill. The need for preliminary dry mixing is completely eliminated. The Barber-Greene does not have to undo the segregation caused by dumping batches into the mill. In fact a cross section of the mix extracted just a few inches beyond the charging end of the pugmill contains the correct amount of each size of aggregate with the correct ratio of bitumen.

Here the propelling and retarding paddles work the material through the pugmill under pressure, using friction to take the excess from the fines and evenly coat the coarse material.

As the mix is constantly worked through (from left to right in diagram) there can be no dead material, even at the very bottom.

The Barber-Greene uses more horse-sense, and less horse-power. It attains complete homogeneity the easiest, most logical way. It has not only established new standards for accuracy and uniformity, — but has changed moving and erection from a major project to a simple low-cost maneuver. Barber-Greene Company, Aurora, Illinois.



UNIVERSAL! SPOT WELDERS ARC WELDERS

GASOLINE and
DIESEL ENGINE DRIVEN
ARC WELDERS

Prompt Deliveries

UNIVERSAL POWER CORP.
4206 Euclid Ave., Cleveland, O.

Surface Treatment On Stabilized Base

(Continued from preceding page)

matic-tired tractor. Just prior to this operation, however, in order to insure an accurate 1 to 1 slope on the base course, a Caterpillar No. 12 power grader with a special blade 5 feet long, set at a 45-degree angle, cut the slope and the shoulder for 2½ feet from the top of the base. Then the brooming operation started, followed by the priming of 1 foot at the edge of the base and 1 foot of the shoulder in one operation.

At the start, this work was done by the contractor's Rosco 1,200-gallon distributor mounted on a Ford V-8 truck and equipped with a 25-foot spraybar, not all of which was used for priming the shoulder as the spraybar was adjustable and only the short section was used for the initial work. Later the contractor used an 800-gallon Etnyre distributor, owned and operated by E. S. Ketchum of Red Oak, Iowa. Tar was purchased, delivered from Joliet, Ill., and was hauled to the job by the distributor and applied to the 2-foot strips mentioned above in two shots of 0.3 gallon each of RT-3 tar. Immediately following these two applications, a single shot of 0.3 gallon per square yard was applied the full 24-foot width of the base and all was allowed to cure 48 hours without traffic.

Surface Treatment

Prior to the next bituminous operation, the 5-foot dirt shoulders were built up, starting 2 inches down on the slope of the base and with the shoulder dropping ½ inch per foot. These shoulders were rolled by the pneumatic-tire and steel-wheel rollers to 95 per cent of Proctor density, using water during the compaction.

After the shoulders had been built up as specified, the surface of the road was shot 24 feet wide with binder oil, an MC-4, at the rate of 0.3 gallon per square yard and immediately covered with 30 pounds of cover aggregate per square yard, using a spreader box. Two applications of MC-4 binder were used, making a total application of 0.6 gallon of bitumen and 60 pounds of aggregate per square yard on the completed surface.

The cover aggregate used on this job was crushed limestone within the following limits:

Sieve Size	Crushed Stone Percentage Passing Min.	Passing Max.
3/4-inch	100	—
No. 4	30	50
No. 8	10	25
No. 30	—	10
No. 200	—	5

Soft or unsound particles retained on No. 8 sieve were limited by specification to 5 per cent maximum, and coal, sticks and clay lumps, 2 per cent maximum, but actually both were much smaller. This aggregate was obtained from the same quarry as the base material.

Each application of bitumen and cover was immediately rolled at least five times by the steel roller and the pneumatic roller to key the material into the base. The aggregate was dragged

by steel brooms to insure a uniform cover just prior to rolling if necessary.

Personnel

This contract for 6 miles of stabilized base on Iowa 184 was awarded to Harco Construction Co., Sioux City, Iowa, on the bid of \$61,680.52. This was a Federal-Aid project, FAP-864. For the contractor, G. Snyder was Superintendent later replaced by H. Wilson. For the Iowa State Highway Commission, the work was in charge of C. C. Letner as Resident Engineer, with T. W. Stringfellow and Leon Jenks, Inspectors in charge at the quarry, Charles Carmean, Materials Inspector, and Lowell Harding as General Inspector in charge of all operations on the road. L. M. Martin is District Engineer for the Iowa State Highway Commission for this area.

Navy "E" to Worthington

Highlighting 95 years of service to the U. S. Navy, the Harrison, N. J., plant of the Worthington Pump & Machinery

Co. has been awarded the Navy "E" for excellence of production. The presentation was made by Rear Admiral Henry A. Wiley, U. S. N. (Retired), before a gathering of more than 7,000 workers and spectators outside the company office at Harrison.

Fewer Contracts Let For Road Construction

In Indiana, state highway construction operations were less extensive in July than in June, although employment by contractors engaged in construction on the state highway system showed an increase, according to S. C. Hadden, Chairman of the State Highway Commission.

Reports for July show 97 contracts in operation, including 43 for bridge projects and 54 for road jobs, as compared with 105 contracts in operation a month earlier. Figures furnished by contractors engaged in work on the state highway system show an increase in their working forces with 2,999 em-

ployed in July as compared with 2,471 in June.

Safety Equipment

The line of Willson products for protection of workers on all types of jobs, including respirators, goggles, face shields, helmets and similar safety items, is described and illustrated in a 40-page catalog issued by Willson Products, Inc., Reading, Penna.

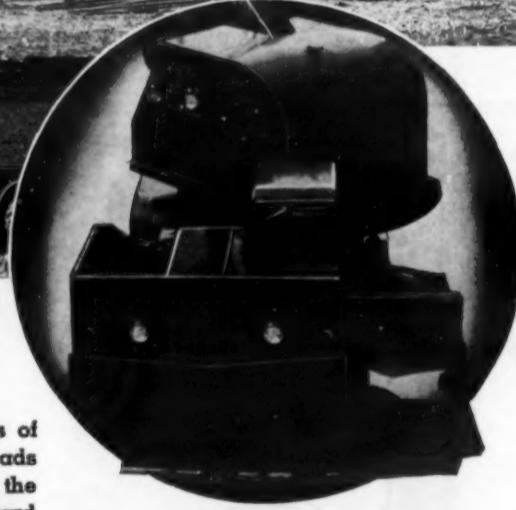
This company points out that, while great strides have been made in the development of personal protective equipment, the best safety devices in the world are useless if the men on the job do not wear them. At this time, when every man-hour of work is vital to Victory, it is important not only to provide protective equipment but also to insure the workers wearing it when necessary.

Copies of the Willson protective-products catalog may be secured by interested contractors and engineers direct from the manufacturer by referring to this item, or from this magazine.

Stick 'Em Up...FASTER!



"More than doubles former erection speed" reports the engineering company erecting these transmission lines in the midwest.



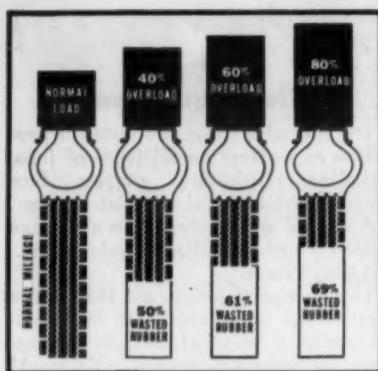
Up they go! . . . these power poles—or skeletons of armament plants—or ships and more ships—or carloads and cargoes—all sped toward early "delivery" with the aid of Michigan Mobile Cranes. Made in $\frac{1}{2}$ yard and $\frac{1}{2}$ yard capacities, these Air-controlled "Michigans" are pace-setters in countless wartime operations today. Your own war program may need Michigan mobility, speed and capacity . . . Toward this end, we offer you the valuable suggestions and cooperation of our engineering staff . . . Write today for Bulletin C-72, and complete data.

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HEATS TAR & ASPHALT
TWICE AS FAST

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Avoid Overloading To Save Truck Tires

The great waste of rubber which occurs when a truck or other vehicle is loaded beyond the rated weight-carrying capacity of the tires on which it rides is shown in the above chart, selected from the many graphic illustrations contained in a new pocket-sized booklet recently issued by the Firestone Tire & Rubber Co., Akron, Ohio, for truck owners and operators.

Written in non-technical language and well illustrated to convey dramatically the all-important story of tire conservation, this booklet "How to Get More Mileage from Your Tires and How to Keep Your Trucks Operating More Economically" is available without charge from Firestone or from this magazine.

By the use of many photographs, drawings, and charts, the booklet describes ways of producing thousands of extra miles of tire service. While it is realized that war-construction schedules and on-time deliveries of strategic materials must often take precedence over other considerations, the booklet points out that there are many occasions and types of service where drivers, by knowing and observing the elementary rules of tire operations, can realize more completely the full potential mileage which has been built into their tires.

The importance of correct tire inflation and its relation to the weight of the load and a simple method for determining maximum weight are fully explained. Correct load distribution, the stage at which a tire should be removed for retreading, and information on the treatment of minor cuts are only a few of the subjects which are covered in this booklet.

HARDSOCC Drills
55 POUNDS OF FAST ROCK-BREAKING ACTION

Operates on a minimum of air.

Make your next drilling job more profitable by taking advantage of the ruggedness and speed of Hardsoocg drills. They are carefully balanced to minimize vibration and their new type valve makes much faster work possible.

Write for complete description and a partial list of satisfied users.

HARDSOCC DRILL CO. OTTUMWA, IOWA

Complete, Compact Diesel Engine Units

So complete is the Sheppard diesel packaged-power unit that, according to the manufacturer, it can actually be delivered running. Equipped with starting batteries, fuel tank, clutch or generator, as desired, all that is necessary is to bolt the unit to the floor and start it.

The R. H. Sheppard Co., Hanover, Penna., maker of this diesel engine, reports that over five years of research and design are incorporated in it. A fuel pump and injection system were developed especially for the Sheppard diesel in order to provide a fuel system which would insure thousands of hours of uninterrupted service. For power, smooth operation and fuel economy, the Sheppard diesel has its own exclusive pre-combustion chamber; the water pump is packed and lubricated for life; the fuel pump and governor are lubricated from the crankcase and require no further lubrication, it is stated; and other features include oil-cooled pistons,

silchrome valve seats, and replaceable cadmium silver bearings. The engines are equipped with Air-Maze air filters, Fram oil filters, Twin Disc clutches, Modine radiators, Electric Auto-Lite starters and generators, Fulton-Syphon thermostats, and Federal Mogul bearings.

The Model 6 Sheppard has a 4-inch bore, 5-inch stroke, three cylinders, and develops 25 hp at 1,200 rpm. If desired, the unit can be furnished with a generator to form a complete diesel-electric plant.

Further information on these diesel units may be secured by interested contractors and engineers direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

types of well-designed easy-dumping dragline buckets available in all sizes from $\frac{3}{8}$ to 20 cubic yards struck measure.

These types, LS, TS and HS, are described in detail with full specifications in the latest Hendrix light-weight dragline bucket folder which will be furnished to readers writing to the manufacturer and mentioning this item.

BARTLETT TREE TRIMMERS
Powerful compound lever cutting head has capacity of $1\frac{1}{4}$ in.
One-piece poles to 16 ft. or sectional poles as required.
Send for catalog No. 27A
Dresser made bear priority certified.
BARTLETT MFG. CO.
3035 E. Grand Blvd. DETROIT, MICH.

Light Dragline Bucket

With equal strength, the lighter the weight of a dragline bucket the more pay-load you can swing every time. Based on this truth, De Soto Foundry, Inc., Mansfield, La., is making three

"Our 760 Yards in 10 $\frac{1}{2}$ hours of $\frac{3}{4}$ and Smaller Crushed Lime-stone"

Says Clarence Dewees,
Marion, Iowa, Contractor



Universal gives us

"Our last tally was on April 29 when we ran better than a yard and a half per minute, a good part of the time with our 822-Q Plant."

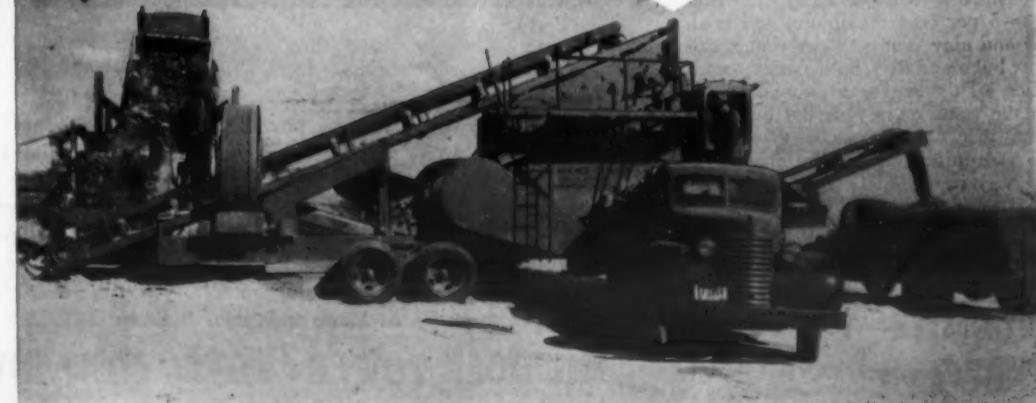
The portable primary, with apron feeder, has a 15" x 36" bronze bearing crusher in use nearly 17 years—has only had two new sets of bearings. Over 100,000 yards were crushed with one set of jaw plates. The portable secondary crushing unit has a set of 30" x 16" bronze bearing rolls 7 years old, a 4' x 8' 2 $\frac{1}{2}$ deck screen, 24" feed conveyor and 18" under-conveyor from roll discharge to Rotovator.

This is another case where Universal took existing equipment, overhauled it and built it into a modern, efficient plant that provides greater yardage with no additional manpower and very little additional expense. It's service like this and profit-proved Universal equipment that has made Mr. Dewees a repeat buyer time and again.

In times like these, Universal Crushers really earn their service stripes by grinding out rock and gravel without being babied, save time and labor, conserve bearing metals and take the load off replacement parts in general.

Besides indirectly helping the War program with crushing plants for supplying airport and road material, Spreaderollers and Asphalt Plants for seal coating and maintenance, paving of roads and airports, we are helping the armament program directly, a portion of our facilities being devoted to ordnance production. We're "Hundred Percenters" on Employees War Savings Purchases, too!

UNIVERSAL CRUSHER COMPANY
620 C Ave. West
Cedar Rapids
Iowa



UNIVERSAL

CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS



C. & E. M. Photo
This narrow unsafe bridge on the outskirts of Ladysmith, Wis., has been replaced by an attractive modern structure.

New Safe Entrance To Ladysmith, Wis.

Hidden Turn Trapping Autos Removed On Wisconsin 27 as It Enters County Seat from South Over 5-Span Bridge

(Photos on page 52)

* THE Wisconsin State Highway Commission not only has given Ladysmith a much more attractive entrance from the south by the construction of the new 449-foot bridge on a relocation of Highway 27, but it has eliminated a death trap as well. On the old road a sharp left turn was required immediately after crossing a railroad embankment which completely masked automobiles approaching from the left or north.

The new entrance is attractively graded with flat slopes and long curves. Although it removes the hazard of the masked turn, it is still necessary to cross one unguarded single track. The multiple crossing with its flashing signals on the old route is matched by a similar crossing on U. S. 8 which the relocation of Highway 27 enters about $\frac{1}{2}$ mile west of the center of Ladysmith.

An old 5-span narrow one-way truss bridge on the old route is also eliminated and this too was hazardous, particularly in winter, as at the south end a sharp right turn was necessary to get on the bridge and at the north end it was approached by a long down grade which was frequently very icy and on which cars easily went out of control. This old bridge was built in 1898 and had the same number of piers in the river as the new structure upstream.

The New Structure

The new bridge of steel construction with a concrete deck is symmetrical, with spans of 75 feet at either end, then spans of 92 feet and a center span of 115 feet. The roadway is 27 feet wide and there are two 16-inch clear wide curbs which have been built to provide space for pedestrian movement if and when necessary. The bridge is designed for an H-15 loading and was constructed under a contract with the L. M. Feller Co. of Rochester, Minn., for \$67,746.20. The work on the 1.3 miles of grading and

gravel surfacing of the approaches was done partly by contract with the Brellenthin Truck & Shovel Service of Elkhorn, Wis., and partly by force account, at a total cost of about \$25,000.

Ladysmith, located on the Flambeau River, the scene of an annual river carnival in July of each year, has a population of 3,671 and is the county seat of Rusk County. The organization and operation of the County Highway Department under D. J. Summerville was described in CONTRACTORS AND ENGINEERS MONTHLY of January, 1940, page 2.

Use of Calcium Chloride As Dust Layer on Roads

The curtailment in the use of road oil, an essential in the war effort, for allaying dust on roads has resulted in an increased use of calcium chloride for this purpose, according to a recent issue of "Dowflakes," issued by the Dow Chemical Co., Midland, Mich.

For many years, calcium chloride has



C. & E. M. Photo
Bounded slopes and long-radius curves feature both approaches to the new highway bridge at Ladysmith, Wisconsin.

been used to provide firm dustless road surfaces by reason of the moisture which it attracts and withholds against evaporation at normal temperatures. Water and oil will not mix; hence, it is pointed out, a special procedure should be used in a calcium-chloride treatment of roads which contain some oil.

In all cases, the oil mat should be

scarified, the excess oil allowed to volatilize, and new aggregate and binder soil added if necessary. Clay, mixed in the correct proportion with the road metal and treated with moisture-attracting calcium chloride, produces a stabilized road surface which is firm, dustless, and on which there is a minimum of maintenance expense, the article states.



CAPACITY + DEPENDABILITY = PEAK PRODUCTION

• Capacity alone doesn't assure the peak performance that is so vitally needed today. Without day in and day out dependability of every piece of equipment, unnecessary delays and curtailed production may result.

Euclid Self-Powered Equipment has proved its superior performance and dependability on hundreds of the toughest jobs . . . it's doing its part in setting new production records for both old and new owners on mining and quarrying operations . . . construction of military roads, airports, naval bases, hydro-electric projects . . . and in many industries where earth, ore, rock and other essential materials must be hauled speedily and efficiently.

If we're not able to supply you with Euclid equipment now, please remember that we must first serve those whose use of new Euclids is regarded by our government to be most essential to the nation's welfare. In the meantime Euclid distributors in centrally located cities and our factory parts depots in Cleveland, Memphis, Hibbing, and San Francisco are ready to supply replacement parts that will enable you to keep your present Euclids operating at peak production.

**The EUCLID ROAD MACHINERY Co.
CLEVELAND, OHIO**



WET Jobs?

Dry Subgrades Guaranteed with

GRIFFIN WELLPOINT SYSTEMS

Whether you Buy or Rent!

BOTH Equipment and Dry Jobs are Guaranteed —
Let us prove that GRIFFIN EQUIPMENT IS BETTER!

GRIFFIN WELLPOINT CORP.
681 EAST 14TH ST. NEW YORK, N. Y.
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EUCLID

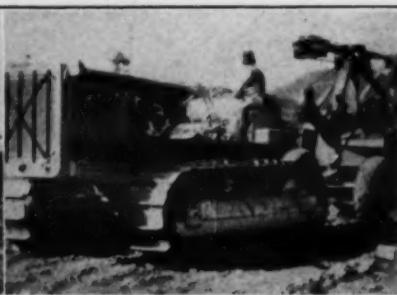
SELF-POWERED
HAULING EQUIPMENT
For EARTH . . . ROCK . . . COAL . . . ORE

CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS





Left, native Indian women carrying dirt on a construction job in Bhopal State in India; right, a native offers the women some competition with a tractor and scraper outfit.



Machines Win Over Cheap Coolie Labor

Hand labor at four to six cents a day sounds cheap enough but a careful check shows again that tractors with rippers, bulldozers and scrapers can still beat cheap hand labor. The latest story comes from Bhopal State, India, where earth reservoirs have been built by contract to conserve water for flooding the rice paddies in famine areas.

Male shovels filled carrying baskets with $\frac{1}{2}$ cubic foot of earth each. These baskets were picked up by native women, hoisted onto their heads, and carried to trucks. The women's work was carefully tallied by men checkers and showed that they averaged between 600 and 800 baskets per day for each woman, depending considerably upon the location of the day's work, the weather and other factors. The women were paid two annas, four cents, for 500 baskets, so that on their best days they were able to earn a little more than six cents.

After a demonstration had proved that American machinery could be operated for one-half of the cost of the work done by hand labor, Caterpillar diesel tractors with rippers, bulldozers and scrapers were moved into the job and the native women went on to other of the many projects so necessary to India and its defense. All through India diesel tractors are now in use building new roads, and widening and otherwise improving old ones so that military equipment and supplies can be moved freely. They are also used in building air fields and aiding in the soil conservation program. The work of tank or reservoir building and canal compacting is also exceedingly vital in India. One "tank farm" will provide moisture for 400 acres of dry land and the food raised on those 400 acres often means the differ-

ence between life and death to several thousand natives.

In recent years many new military roads have been built in the wild hill country of India so that this region may become more accessible to soldiers who have to deal with dacoits, the murderous gangsters of the area, who roam the territory. In these and other operations regular soldiers are usually sent along with the tractor operators to stand

guard. It is reported that native men make excellent tractor operators after they have been properly instructed and trained. The average operator takes great interest in the equipment and pride in his work. Many times they will not rest or eat until they have carefully wiped and cleaned their machines.

New Tubeless Tire Conserves Rubber

The invention of a heavy-vehicle tubeless tire is important today because of the savings it makes possible in the rubber ordinarily required for inner tubes and flaps. Use of a specially-designed locking member which retains the air in the casing is the secret of a new development by the B. F. Goodrich Co., Akron, Ohio. Already substantial test results obtained by the company have demonstrated the usefulness of this new tire and its ability to perform under all kinds of difficult road conditions. Further tests under other auspices are now

being conducted.

The new device can be mounted in a tire easily and requires no special tools. In the event the tire is cut or otherwise becomes deflated, valuable time can be saved in repairs as there is no inner tube to be patched or replaced. The amount of rubber saved by the new invention varies with the size of the tire. The minimum saving is approximately 7 per cent of the rubber content of the conventional casing, tube and flap ensemble.

Burton L. Boye Dies

Burton L. Boye, President of The Asphalt Institute from 1933 to 1938, and formerly in charge of the Asphalt Department of the Standard Oil Co. of New York, died at Summit, N. J., on July 9. Mr. Boye had served with Socony for 38 years at the time of his retirement in 1938. He had recently been filling a war emergency post as Acting Mayor and President of the Common Council of Summit.

FIGHTING FIRES before they start

Most fires are preventable. A smoldering cigarette, flipped carelessly into a dark corner . . . a welder's spark flying unnoticed into a pile of oily waste—these little things can, and do, start devastating fires.

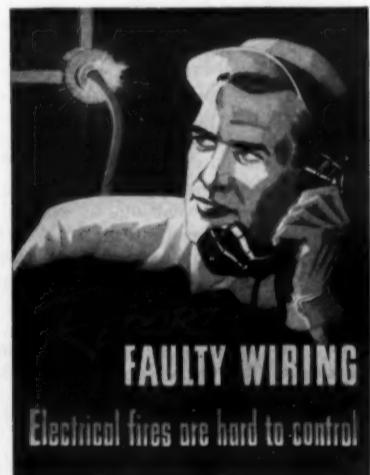
At the beginning of the war emergency, recognizing that fire is a treacherous and deadly saboteur of production, Bethlehem intensified its attack on the fire hazard. As always,

trained, fully-equipped fire-fighting forces supplied the backbone of the fire-control effort, maintaining day-and-night vigilance in every Bethlehem plant and shipyard.

But to bring home the vital importance of fire prevention and control to every Bethlehem employee, we've designed a series of posters in full-color and are displaying them in key locations throughout all Bethlehem

shipyards and steel plants, which are now engaged in vital war work.

These posters are based on analysis of the most serious causes of fire and the all-important part of the human element in fire prevention. By pointing out to employees specific ways in which they can prevent or subdue fires, the posters are helping to minimize a potentially grave threat to the production of war materials.



Five of Bethlehem's series of fire-prevention posters. These posters are printed in full color. Each poster is designed to emphasize a specific problem in fire prevention or control.



War-production plant executives who are carrying on fire-prevention campaigns may find these posters of interest. A complimentary set will be supplied on request to Bethlehem Steel Company, Bethlehem, Pa.

The Warning Lantern . . . with the **SAFETY BEAM**

EMBURY
Traffic Gard

An ever-watchful sentinel for the streets and highways of today. Strong. Leakproof. Storm-tested. Ruby Fresnel safety lens magnifies the flame to beacon size. Pint of oil lasts for 3 days and nights. Base is non-tipping. Choose Traffic-Gard for better protection at lower cost.

Embry Mfg. Co., Warsaw, N.Y.

From Soup to Nuts On Rhode Island Job

M.A. Gammino Const. Co., Inc.
Moved 50,000 Yards of Rock
In One Cut; Deep Muck Holes
On Relocation of R. I. 146

(Photo on page 52)

Starting early in May, 1941, M. A. Gammino Construction Co., Inc., of Providence, R. I., began the relocation of 2.07 miles of Louisquissett Pike, R. I. Route 146, running north from Providence to Woonsocket. The contract included grading and drainage, and the material ran from soup to nuts—sloppy muck holes saved from being at their worst by lack of rain, and 71,000 yards of igneous rock, with 50,000 yards in one big cut.

The Big Rock Cut

The maximum depth of the big cut was 35 feet through a tough igneous rock, with from 1 to 2 feet of overburden. The heavy drilling was done by a Bucyrus-Erie Armstrong well drill, driven by a Buda motor, mounted on a Mack truck and equipped with an 8-inch bit. The well-drill holes averaged 36 feet, with a maximum of 39 feet. When shooting the blast holes, they were fired in groups ranging from two to twelve. Each hole was loaded with 550 pounds of 60 per cent American Cyanamid & Chemical Corp. dynamite, using the same company's primer cord. The charges were placed at the bottom, middle, and top of the holes, leaving about 10 to 12 feet of tamped sand at the top and with the same plugs between the other charges. The bulk of the explosive, 375 pounds, was placed at the bottom, 125 pounds at mid-height, and 50 pounds in the top charge. The primer cord was run from the top of the hole down to the bottom charge, and exploded each charge in succession. The initial charge was set off by a blasting machine which fired an electric cap which in turn discharged the primer cord and subsequently the dynamite. The primer cord served two purposes: it discharged the dynamite and also provided a means of connecting the numerous charges, permitting decking of the deeper holes and allowing an unlimited number of charges to be set off as a unit.

Additional drilling equipment in shallow sections at the end of the big cut comprised three Ingersoll-Rand wagon drills, using 2 3/4-inch Timken detachable bits, to drill holes from 18 to 25 feet in depth. These were supplemented with three Ingersoll-Rand Jackhammers, drilling from 3 to 4 feet deep, which were also used to drill block holes in boulders and to clean up the few high spots in the subgrade and slopes.

The compressor equipment for the job consisted of one Sullivan 315-foot compressor driven by a Caterpillar 11,000 diesel engine, two Schramm 315-foot compressors driven by gas engines, and one 115-foot Ingersoll-Rand trailer compressor.

The broken rock was excavated by a

Northwest and a Marion 1 1/2-yard shovel, powered with Caterpillar 13,000 diesel engines, loading to three Sterling trucks, one Autocar, one BX Mack, three ER Macks, and three AC Macks equipped with Cummins diesel engines. The average haul from the big cut was about 1,200 feet; and, working 10 hours a day, the outfit handled about 1,900 yards as a day's output.

Moving Muck

Some delay was experienced on this contract because the equipment requirements of the number of jobs which were bid successfully by the contractor slightly exceeded even the large equipment roster of M. A. Gammino. For this reason, there was a delay in equipping the Louisquissett Pike job completely. The

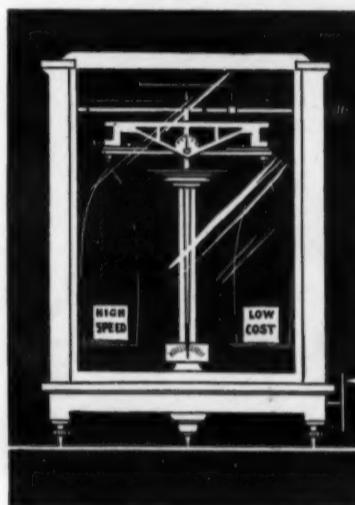


C. & E. M. Photo
A Northwest 1 1/2-yard shovel loading a Sterling truck, and an Autocar waiting for its load. No shovel hold-up here.

Pike job, however, did have one unusually fine piece of good luck: namely, that scarcely a drop of rain fell on the job throughout the length of time it was in operation. This was of particular

benefit in aiding the excavation on an 800-foot muck hole which ran up to 12 feet deep. It was excavated by a 1 1/2-yard Marion dragline having a 60-foot

(Concluded on page 39)



SEAMAN PULVI-MIXER Provides PRECISION-PROCESSING In Highway and Airport STABILIZATION At Higher Production

Where a stabilization process demands absolute precision in mixture of materials — it's the SEAMAN PULVI-MIXER that gets first call. In soil cement stabilization, for example — a process widely and successfully used in highways and airport runways — the SEAMAN PULVI-MIXER provides precision control of both dry and wet mixing operations. Moisture content, so important in this process is far better controlled by the SEAMAN PULVI-MIXER than by any other method. And the SEAMAN not only does the job better — it does it faster and at less cost.

The SEAMAN PULVI-MIXER pulverizes and mixes at accurately controlled treatment depths. It's the principle of rotary action that does the trick. Scientifically curved and staggered tines revolving at high speeds displace and mix road materials within the hood at speeds that cut costs sharply — and with a thoroughness that exceeds all previous standards for mixing operations.

The SEAMAN PULVI-MIXER is manufactured in two basic models — the tractor operated in which power is furnished by the rear power take off of the tractor; and the motorized in which power is obtained from an engine connected to the rotor shaft. Investigate the SEAMAN PULVI-MIXER now. Your inquiry for Bulletin 226 will get prompt attention.



1. Precision processing control
2. Better dry-mix processing
3. Better wet-mix processing
4. Better pulverization
5. Faster production
6. Lower operating cost
7. Lower investment



Complete line of
gasoline, pneumatic and electric driven
concrete vibrators and grinders
Write for information and prices
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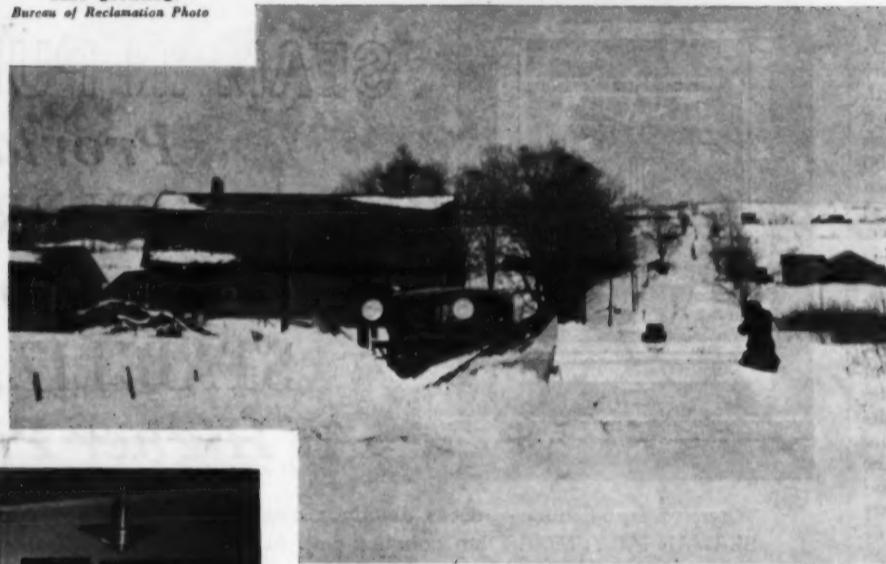
SEAMAN MOTORS MILWAUKEE WISCONSIN



DRILLING

one of hundreds of grout holes into bedrock below Friant Dam in California preparatory to final high-pressure grouting.

Bureau of Reclamation Photo



OPEN ROAD. Plowing an important New York town-country highway serving an Army camp to which the road must be open 365 days, and nights, a year. The snow-removal unit is a Frink 168SP nose plow and leveling wing on an FWD truck.



C. & E. M. Photos
INSIDE AND OUT. At right, the well-landscaped grounds and District Garage of the North Dakota State Highway Department at Valley City and, above, a scene in the District offices located on the second floor of the garage building.



Bureau of Reclamation Photo

ON GUARD. A sentry on guard at the Sacramento version tunnel, built by the Sacramento Railroad, which will now be used to work on



FIRST CUT. The start of work for 9 miles of traffic divider on Grand Central Parkway, Long Island, N. Y. To insure a true line, Concrete Cutting Corp. of America attached a special framework supported by four rails to one of its Junior Rapid Pavement Breakers.



NICE LINES. The line cutting completed, ready for breaking out the concrete pavement.



FIRST BREAK. Next the large pavement breaker broke up the center of the trench for the divider.

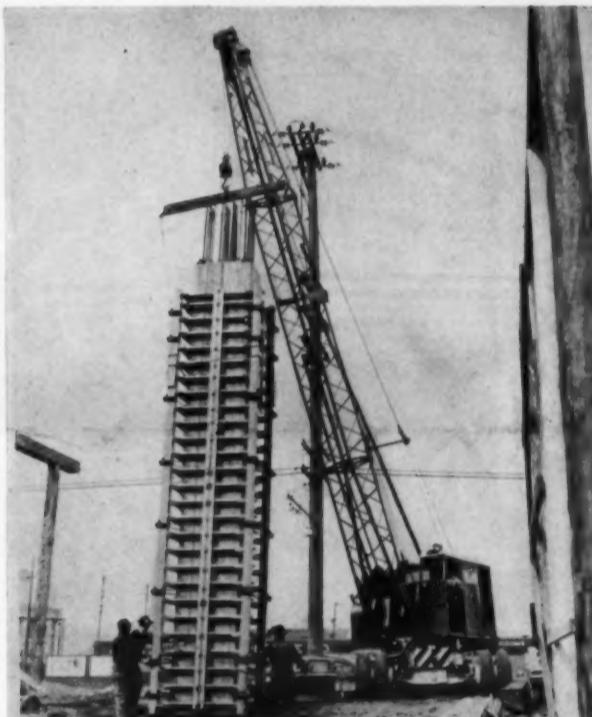


FINAL BREAK. Down to the reinforcing steel to which the divider was tied. **P.** The was and ready

Photos Stories

FLIGHT STRIP. This aerial view, showing how land for a Flight Strip is utilized adjacent to a highway, is of the first Flight Strip to be completed, somewhere on the Middle Atlantic seaboard. "A" indicates where aircraft are hidden and "B" the adjacent highway.

Official Photo, U. S. Army Air Force

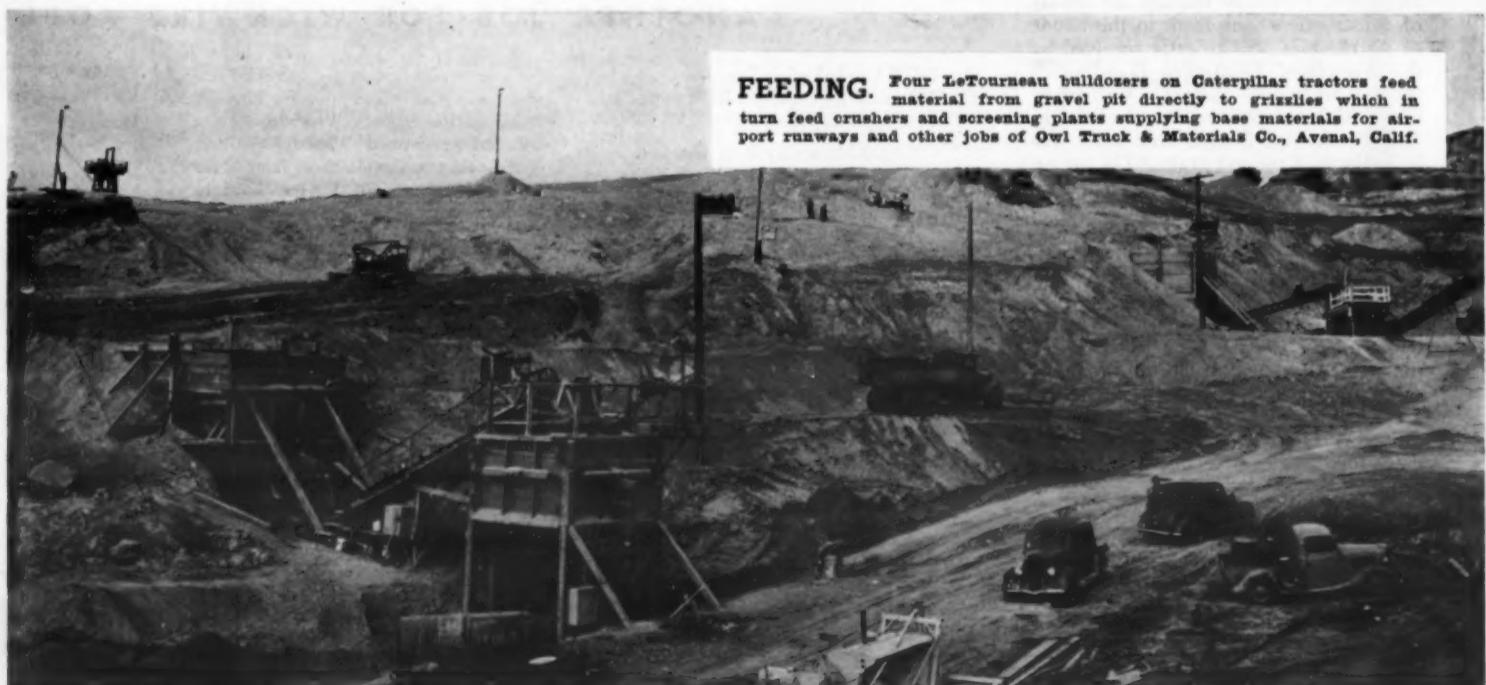


TIGHT QUARTERS. Working in cramped quarters, between falsework, with traffic on both sides, this General Supercrane is setting column forms for the new \$1,000,000 viaduct in Seattle, for which McRae Bros. of Seattle is the contractor. It is reported that the operation of removing the $39\frac{1}{2} \times 29$ -foot form, weighing 10,000 pounds, from the truck and placing it took less than 15 minutes.

DIGGING IN. The Blackwell Engineering & Construction Co.'s Parsons dumper, powered by a Caterpillar D8800 engine, digging a sewer trench, which increased from 2 to 12 feet in depth, near Falls Church, Va. The machine, shown below, averages 1,400 feet a day.



FEEDING. Four LeTourneau bulldozers on Caterpillar tractors feed material from gravel pit directly to grizzlies which in turn feed crushers and screening plants supplying base materials for airport runways and other jobs of Owl Truck & Materials Co., Avenal, Calif.



... of the Shasta Dam di-
by the Southern Pacific
to Sacramento River past the



The broken concrete
was then removed
and ready for the divider.



The new Rex self-aligning idler for flat conveyor belts.

Self-Aligning Idler Increases Belt Life

Keeping a conveyor belt in a central position on its supporting idlers is very important for the longest possible life of the belt. To serve this purpose, the Chain Belt Co., 1666 W. Bruce St., Milwaukee, Wis., has developed a new self-aligning idler for flat conveyor belts, both return and carrying.

It is stated that the operation of this new idler is sensitive and instantaneous. If, for any reason, the conveyor belt runs to one side, it has a tendency to swivel the idler in a horizontal plane. If this is not sufficient to cause the idler to swing enough to force the belt back immediately, the belt continues to travel to one side until it contacts the counterweighted end disk, which is slightly larger in diameter than the idler roll. Contact with the counterweight tends to rotate it, but since it is a counterweight it resists this tendency and produces a counterforce on the idler. This causes the idler to swivel rapidly, throwing the idler more out of line which immediately forces the belt to swing back the other way, and return to its proper position.

These Rex flat-belt self-aligning idlers are sturdily built on the same principles as the Rex self-aligning troughing idlers. No side guide rolls are used. Where excessive misalignment of a conveyor belt exists, caused by such factors as stretch or weave in the belt, uneven loading of material on the belt, or shifting of the conveyor frame, it is reported that Rex self-aligning idlers spaced at intervals between the stationary idlers will automatically bring the belt back to the central position and thus avoid the possibility of serious injury to the conveyor belt.

Further information on these new idlers, as well as on other Rex anti-friction-bearing belt idlers in a size and type for every belt-conveyor need, may be secured direct from the manufacturer.

New Interpretation Of Repair Parts Order

An interpretation of Preference Rating Order P-100, to include the repair of construction equipment in the hands of distributors, was recently received by the Associated Equipment Distributors in a letter from Dean C. Gallagher, Chief, Maintenance and Repair Branch, War Production Board. This letter was in reply to a request from AED for an interpretation of the Order to make repair parts more readily available to distributors rebuilding construction machinery urgently needed in furthering the war effort.

Last January, AED announced an interpretation received from the Maintenance and Repair Branch on P-100 that the Order should be used to obtain repair parts for equipment in rental service only, and not to replace complete units or to repair construction equipment for sale. The recent interpretation removed the restriction on the use of the Order to repair equipment for sale.

Mr. Gallagher said, in part, "This interpretation is by no means designed to afford distributors the right to use the rating of P-100 to stock parts in quantities. It should be used to repair existing equipment as the necessity arises and if material is taken from the stocks of these distributors to make such repair, the Order may be used for replacement of such parts only."

Wear-Resisting Steel Replacement Parts

There are many parts of construction machinery which are subjected to the toughest kinds of wear. For example, tractor and shovel crawler shoes, crusher jaws, mill liners, roll shells and mill hammers are among the parts that wear out and must be replaced to keep equipment running.

Bulletin 117 of the Alloy Steel & Metals Co., 1862 E. 55th Street, Los Angeles, Calif., discusses a wide variety of replacement parts which this manufacturer has been supplying to a number of large and important operators of heavy equipment, in some instances for as much as 20 years. Through years of experience in manufacturing the various grades of steel and by careful and scientific study of actual field conditions, it has been possible to prepare precise metallurgical specifications for the various types of long-wearing parts.

Copies of this bulletin will be sent promptly to readers of this magazine.

Make Your Stationary Equipment PORTABLE--with EWC Mountings!

These strenuous days call for easy, flexible portability of all types of machinery. Just tell us the size and weight of the unit, and the likely speed and road conditions. Our years of engineering experience will assure you of sound, practical aid in developing an efficient mounting—wheels, axles, tongue, springs, etc.



EWC WHEELS

Write today. No obligation.
ELECTRIC WHEEL CO.
DEPT. CM
QUINCY, ILL.



Feeding War Dogs ANOTHER JOB FOR WICKWIRE ROPE

We'll be glad when it's over . . . when Wickwire rope can get back to the jobs of a world at peace.

The quickest way from here to there is for us, and for you, each day now, to put everything we have into winning.

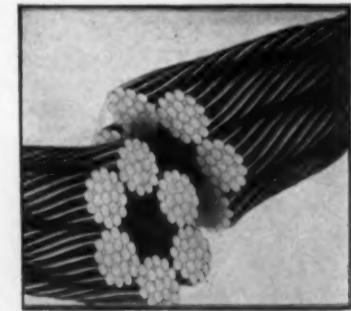
We are doing it by working day and night, seven days a week, on Wickwire Rope for our shipyards, our Liberty Fleet, the army, marine corps, coast guard and navy . . . and for industries whose production is so urgently needed.

You are contributing when you take care of your wire rope, making it last longer . . . so that there is more available for war needs.

But when you must have new wire rope,

for war production or for essential services, ask your distributor for long-life Wickwire Rope. Both Wickwire regular lay and pre-formed Wissco Lay have quality that has made them famous for low cost per year of use. We put that into Wickwire rope by controlling every step from ore pile, through blast furnaces, open hearths, precision wire drawing, and skillful laying of the rope.

A FREE BOOK, "Know Your Ropes," is waiting here for you. More than 25,000 wire rope users all over the world consider this a bible on the selection of wire rope—and making it last longer. Write Wickwire Spencer Steel Company, 500 Fifth Ave., New York, N. Y.



REVERSE ROPE FOR LONGER LIFE
Frequently, most severe strain, due to close bending, occurs near one of the ends. Rope life is increased by exchanging the drum end with the load end. This and forty more rope life-savers are fully described in the free book, "Know Your Ropes."

SEND YOUR WIRE ROPE QUESTIONS TO WICKWIRE SPENCER



WICKWIRE ROPE

Sales Offices and Warehouses: Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles, Tulsa, Chattanooga, Houston, Abilene, Texas, Seattle. Export Sales Department: New York City



Highway Right-of-Way Procedure in Indiana

State Highway Commission Set-Up Provides for Land Acquisition by Easement, Deed or Condemnation

By W. E. HOFFMAN, Right-of-Way Supervisor, State Highway Commission of Indiana

♦ ADEQUATE transportation facilities on land, on the seas and in the air are essential parts of our national life, particularly right now if we are to cope with the situation thrust upon us by the enemies of democratic government. Our transportation systems in the United States, especially on land, are the best in the world. However, it is necessary to construct some new roads and to extend and improve others to attain the efficiency in motor-vehicle transportation required for the successful prosecution of a war.

To facilitate the acquisition of rights-of-way for such projects, the Defense Highway Act, approved by the President on November 19, 1941, provides that the cost of acquiring new or additional rights-of-way necessary for highway projects thereunder may be included as part of the construction costs of such projects. It also authorizes Federal participation in such costs to the extent determined by the Federal Works Administrator under conditions to be met by the different states. Projects included under this Act are as follows: secondary or feeder roads on lines of the strategic network of highways but not on the Federal-Aid highway system; access roads and for replacing highways shut off from general public use at military and naval reservations and defense industry sites; new and additional lands for flight strips and off-street parking spaces; and for new and additional rights-of-way for projects on the strategic highway network.

Indiana's Procedure

The State of Indiana is fortunate in authorizing by statute a general line of procedure for securing rights-of-way which conform almost entirely with the Defense Highway Act requirements to be met by the states. The Indiana State

Highway Commission has broad powers with which it may honestly administer its office in a manner best for the commonwealth.

Most Hoosiers are better-highway conscious. They are educated to the fact that roads are located where they are most needed to serve them best with the greatest degree of safety to life and property. There will always be complaints from people who have real estate and other interests off the line chosen for the construction of a new and modern highway. If and when these people are able to show that a road constructed on the line proposed will not serve the general public best, the policy of the Indiana Commission is to run a new line or lines for the purpose of comparing rights-of-way costs, construction costs,

length of projects, drainage facilities, etc., before making a final decision on location.

For divided-lane highways in Indiana, the right-of-way width is from 140 to 200 feet, depending on the width of the dividing strip. In built-up sections and urban areas, 4-foot concrete dividers are constructed, whereas 30 to 40-foot parkways are used in rural sections. For all other types of construction, the right-of-way ranges from 80 to 100 feet wide.

Right-of-way is acquired by Indiana by easement, warranty deed or by condemnation. The form of conveyance used in most right-of-way acquisitions is an easement, for the reasons that (1) land owned by the State, in fee simple, must be sold to the highest bidder at its appraised valuation or more if and when it is no longer needed for public use; (2) because land in rights-of-way secured by easement reverts to the adjoining property owners when it is not needed for public use; and (3) because all land in highways may be taken out of taxation, regardless of the public

rights and interests in such land.

However, land for highways is frequently granted by property owners without money consideration, the consideration named in such grants being the benefits to be derived from the use of the proposed road.

The Indiana law of eminent domain requires the State to base its estimate of damages to property on: the value of the land sought to be appropriated; the value of the improvements, if any, on the land sought to be appropriated; the damage, if any, to the residue of the real estate of the owner caused by taking out the part sought to be appropriated; such other damages, if any, as will result to the defendant from the construction of the improvement in the manner proposed; the benefits, if any, to the residue of the real estate resulting from taking the part to be appropriated.

When a condemnation suit is filed, the court appoints three qualified and disinterested freeholders to appraise the property. The court also instructs them

(Concluded on page 51)

HERCULES HOISTS AND DUMP BODIES

"Service Built"

Hercules Speedraulic Hoists and Dump Bodies are brutes in strength as well as appearance. Built for steady, grueling, every day service, these powerful hoists are available with 6", 7", 8" and 10" cylinders to meet all load requirements.

Hercules Dump Bodies are built in all styles and capacities, heavily reinforced for the toughest hauling jobs. Subframes are network of heavy I beams, welded into a rigid structure. There is no seam in center of body floor.



→ Hercules SPEEDRAULIC Hoist Model 10X with Hercules rock body of 13 cu. yds. capacity. Mounted on 180" wheel base chassis. There's a Hercules for every type of dump body service.

MORE LOADS PER DAY

First on the job with the heaviest loads—That's the story of Hercules performance. Speedraulic Hoists are powerful "Center-Lift" hoists, with double, bridge type lift arms which lift ahead of load center—applying power where most effective, with a minimum of lifting effort and low oil pressures. There is no high pressure oil piping, no excess strain on body or chassis, no pushing against body hinges.

Fast, efficient action is a prime feature of Hercules equipment. Speedraulic Hoists and bodies are built to do a big job in a hurry. There is no loose play, no back-tipping of body. No chains or gadgets required.



MOST PROFITABLE FOR REINFORCED CONCRETE BUILDING CONSTRUCTION

When the job calls for mass vibration—the Viber Vibrator at work above is your best bet. Especially made for walls over 10 inches thick, foundations, large girders, thick floor slabs, columns . . . large reinforced concrete bridges, grade separations, concrete floor systems, concrete arches and rigid frame structures . . . In a word, for all concrete with large aggregate and low water-cement ratio.

Write for complete VIBER data TODAY!

VIBER COMPANY
726 So. Flower
BURBANK, CALIF.



**HERCULES
STEEL
PRODUCTS**

—
GALION, OHIO



Unusual Dirt Moving Methods on Dam Job

(Continued from page 7)

or deck, of the superstructure, where the dirt was later fed in.

The floor of this superstructure was laid on a combination of sills, with 12 x 12-inch timbers on either side of the gate frame. These were laid horizontally across the pier tops, each sill resting on the 12-inch dimension of the same numbered pier at either side. Joints were secured with $\frac{3}{4}$ -inch round steel drift pins.

The cross sills to carry the gated opening were 12-inch Carnegie steel H-beams, spaced on 4-foot centers so that they would also rest on the upright timber piers. The gate frame was welded to each H-beam, and the $\frac{1}{2}$ -inch web was used as a track to carry the roller-mounted gates. Over this cross framework 6 x 12-inch timber flooring was laid and spiked over all the area, except the 5 x 10-foot gated opening.

In order to deliver the dirt from the bulldozers to the gated opening, a feeding hopper 6 feet high was built on the main deck. It was constructed of 3 x 8-inch timbers, laid on a 1 to 1 slope with a 6 x 8-inch timber at the top. Four 6 x 6-inch braces on each side of the hopper leading from the 6 x 8 down to the 12 x 12 outside sill under the deck floor carry the weight of the hopper even when it is completely heaped with earth. Short wing walls on each side prevent any dirt from spilling into the roadway under the gated opening.

The weight of the load of dirt in the feeder hopper over the gates made any system of hand operation impractical. The gates were therefore designed for operation by the action of a piston rod operating from a master cylinder. Multiple-way valves control the direction of travel. The gate rigging system in use provides for all three gates to open 3 feet simultaneously. A 12 x 36-inch cylinder was installed at the south end of the hopper near the middle of a floor sill, so that the two ends of the piston rod would be clear. To each end of this rod, cable was rigged around two sheaves, connecting to the gates in a straight line. The opening and closing of the gates are thus easily effected by the travel of the piston.

The normal action of dirt falling through the gates would be to concentrate the load on the side of the opening which opened first and closed last. To offset this problem, a timber baffle was suspended below the gates to train the falling dirt at the exact center of the gates. This results in well-centered heaping loads.

Excavation Methods

Sixteen Euclids represent a sizable investment. Tie up the production schedule of an investment like that in the operation of only two bulldozers and the element of chance enters the picture. The Santa Fe contractors didn't take chances. They brought out a Caterpillar D8 tractor equipped with a LeTourneau power control winch and a Model XD9 bulldozer, reinforced with steel corner plates. A Caterpillar D7



A bulldozer feeding the loading hopper during the early stages of work.

machine with a Wooldridge power unit | and blade was the other part of the bulldozer team. Add to that a Wooldridge triple-toothed rooter that loosened the clay 3 feet deep and the bulldozers could move full loads every trip.

Ripping was scheduled to be handled over the entire area on the day shift by the D8 tractor. The hard dense clay is rooted in rows leading downhill to utilize the weight of the tractor in the first ripping. Then it is cross-ripped later, to really break it up. Cross-ripping does not require quite the drawbar pull that initial ripping does, and can be performed without difficulty in first gear. The initial process is done in first gear, too, because the operator can not go any lower. Rooting downhill, however, uses enough tractor weight to increase drawbar pull sufficiently to overcome that difficulty. When even that fails, the rooter can be lifted slightly or the crawler tracks "wagged" by pulling one steering clutch and then the other.

Most of the dirt is moved down during the swing shift, from 3 to 11 p.m. Days are long enough from May to October to

(Concluded on next page)

● It's going to be increasingly important to speed up the jobs of building and maintaining roads vital to on-time delivery of materials for our armed forces and civilian workers. You who own "99" Motor Graders can accelerate these jobs with the equipment described below.

WEAPONS OF WAR



ON THE HOME FRONT

● The "99" Loader is a time- and money-saver for both construction and maintenance operations. On new highway projects it quickly removes excess dirt between forms . . . leaving a smooth, firm surface. When ditches must be cleaned or sod shoulders "skinned off", lowered and carefully graded to prevent the accumulation of

surface water, it does the job in a fraction of the time otherwise required.

The "99" Shoulder-Trencher makes a straight, clean-cut trench to a maximum depth of 8" below pavement surface, and windrows waste material for easy loading into trucks by the "99" Loader. A real time-saver on highway widening operations. Write for details.

THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois

MOTOR GRADERS • BLADE GRADERS • ELEVATING GRADERS • SCRAPERS • CRUSHING AND SCREENING PLANTS • ROLLERS
ROLL-A-PLANES • MOTOR SWEEPERS • SHOVELS AND CRANES • SCARIFIERS • DUMP CARS • TRAIL CARS



Bulldozers Handle Earth for Dam Core

(Continued from preceding page)

enjoy daylight for more than half the shift. The two machines team up together then for a record performance. Both operators are excellent craftsmen. They can carry a load down the hillside while traveling abreast with the bulldozer blades touching end to end.

This procedure, while spectacular, is no mere grandstand play. By keeping the blades together they carry down twice the volume of dirt normally rolled off the corner of a bulldozer and they spread the plowing and rolling action of the bulldozers over a wider area. Where every cubic yard counts, the system is an excellent one. It was used successfully in mud at San Diego in that never-to-be-forgotten rainy winter of 1940-41 with 15 Caterpillars working abreast. That will work if everything else fails. It requires experienced well-trained and cool operators, however, for it is not a great deal different from flying a bomber in formation.

The earth is rolled down at Santa Fe and stockpiled in a huge mound all around the hopper on the swing shift. Thousands of cubic yards are brought down. When the first hopper was built, the clay knolls stood 40 feet high and ramps had to be cut through the clay down to each side of the feeder. In three weeks the machines were working on fairly level ground.

One tractor feeds dirt through the hopper to Euclids on the graveyard shift from 11 p.m. to 7 a.m. The other machine continues to roll material down, of course, as it does when one rips in the daytime. If the clay deposit continues down beyond the level point, the contractor's executives plan to use one or two more bulldozers to feed while the original machines continue supplying clay for the stockpile.

All pushing is done in first or second gear, and the nature of the topography is such that pushing distances are limited to 400 feet. All dirt-moving men know that the bulldozer is unexcelled for moving dirt such short distances.

In moving a load of dirt to the stockpile edge, it is usually necessary to drop the blade a foot or so very suddenly, catching it on the winch cable to break the fall. This shakes off any clay sticking to the curved part of the blade, but it is especially destructive to the control cables. The sudden concentration of weight will crush, straighten out the lay, and break any wires not sharing the load equally. This contractor uses a 9/16-inch preformed improved plow steel 6 x 19 rope with an inner wire rope core, and gets an average of 700 hours of wear per installation. This is definitely up to contemporary par.

Another point this bulldozer combination brings to light, and a point which many excavating men fail properly to understand, is the matter of front idler bearing wear. Tractors engaged in bulldozer work wear out front idler bearings notoriously, but the explanation is not complicated. Tractors with bulldozers usually back up about as much as they



A Euclid beneath the hopper quickly loaded with 13 yards of selected clay for the 5-mile haul to the core section of Santa Fe Dam.

go forward. In reverse, the pull of the crawler tread is against the top of the track and the top of the front idler bearings. They wear out and have to be replaced, even though the center and

rear ones are still serviceable.

Very often this fault is ascribed by inexperienced excavating men to the fact that the tractor carries a bulldozer blade. This is not true, for the same thing

would happen if the machine traveled an equal distance in reverse without the blade, provided, of course, that the center of gravity of the tractor is not disturbed too much by the addition of a bulldozer.

Excellent maintenance care is dished out to the Santa Fe machines every 12 hours by a portable truck, carrying fuel, accessories and lubricants. All parts with Alemite fittings are greased each 12 hours. The strenuous work these machines are doing makes necessary a more liberal greasing of the clutch throw-out collars than is usually needed. Lubricating oil in the crankcase and cooling water is checked twice per shift, and crankcase oil is drained every 60 running hours.

Personnel

Officials responsible for this unusually efficient performance are Project Manager R. F. Rasey, General Superintendent Al Johnson, Project Engineer Charles F. Bradley, and Excavation Superintendent George Haensel.

"Built to Endure" Construction is more important today than ever



LIKE all power-driven equipment Cletrac Tractors must be serviced and kept in repair to deliver fullest possible use.

Cletracs have always been famed for their dependability and long life, because Cletracs are engineered and "Built to Endure."

fortunate, then, are Cletrac owners who can take advantage of Cletrac's lasting construction at a

time when production of new tractors is curtailed. It is your obligation to the War Effort to keep your Tractors and other equipment running in top-notch condition.

Your Cletrac dealer is ready with parts and service to give you every possible assistance in providing your present equipment with even longer life than you might expect.

CLETRAC CRAWLER TRACTORS—GASOLINE AND DIESEL
18 TO 96 HORSEPOWER

THE CLEVELAND TRACTOR COMPANY
CLEVELAND, OHIO



SAND'S-STEVENS Line & Surface LEVEL



Endorsed and Adopted by Road Builders and Contractors

Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy, and accuracy guaranteed.

SAND'S LEVEL & TOOL CO.
5511 Gratiot Ave. Detroit, Mich.



The new No. 7300 25-ton screw jack.

A 25-Ton Screw Jack For Industrial Uses

A new 25-ton standard-speed bevel-gear ball-bearing screw jack, listed as No. 7300, has been announced by Templeton, Kenly & Co., Chicago, Ill. This jack is designed for heavy-duty lifting, lowering and skidding operations and it is stated that the safe mechanical action, screw adjustment, and enclosed ratchet mechanism, combined with both toe and cap lift, make it especially adaptable to heavy industrial work.

The toe lift is a minimum of 11 inches from the base but the jacks can be made with the toe in any position to suit the user's particular requirements, and the base designs can be modified. The manufacturer guarantees this jack, which weighs only 82 pounds complete, to lift to its full rated capacity of 25 tons on the cap and 12½ tons on the toe.

Further information regarding this heavy-duty jack may be secured direct from the manufacturer by mentioning this item.

Weld Inspection Chart

An arc welding inspection chart, which provides welding inspectors and others concerned with weld production with a simple and helpful aid in inspecting welds, has just been published by the Lincoln Electric Co., Cleveland,

Ohio. This chart presents very graphically the different types of welds obtained when the work is done normally, with normal current, voltage and speed, as compared with those obtained when these factors are not normal.

Accompanying the photographs which illustrate these conditions is a table indicating the burn-off of the electrode, the penetration of fusion, the appearance of the bead, and the sound of the arc with each value of current, voltage and speed of welding. For example, with normal current, voltage and electrode speed, the burn-off of the electrode gives a normal appearance of the weld coating, a fairly deep and well-defined penetration, excellent fusion of the bead with no overlap, and an arc that burns with a sputtering hiss plus sharp crackling.

The inspection chart also illustrates the use of the Fleet-Fillet technique of welding, recently developed by the Lincoln Electric Co., and how the speed of welding increases as the size of the electrode increases.

Copies of this chart are available free of charge to inspectors of welding and others concerned with welding by writing direct to Lincoln and mentioning this item.

A New Clear Liquid For Concrete Curing

Another clear liquid curing agent, to be sprayed on concrete as soon as the finishers are off the work, to seal in the water and thereby prevent evaporation and hair-checking, has been announced by Truscon Laboratories, Detroit, Mich. It is stated that this new material, known as Tru-Cure, produces the equivalent of a 14-day water cure without the labor expense of hauling dirt, wetting surfaces, applying other covers, and making and breaking pipe connections.

Laboratory tests made by the manufacturer have shown that Tru-Cure has moisture-retaining qualities of high limits, better than 96 per cent in 24 hours at a temperature of 110 degrees

F, or 90 per cent at 7 days. This curing process starts immediately upon application, thereby largely eliminating crazing and such shrinkage cracking as results from too rapid moisture evaporation soon after the concrete is placed.

For more detailed information on this new cost-saving method of concrete curing, write to Truscon Laboratories, Detroit, Mich., ask for Bulletin No. 534, and mention this item.

New Hoist Catalog Covers Utility Tools

A new general catalog, No. G-6, has been issued by Coffing Hoist Co., Danville, Ill., containing in condensed form data, specifications and prices on the complete Coffing line of ratchet lever hoists, electric hoists, spur-gear chain hoists, differential chain hoists, I-beam trolleys, load binders and the comprehensive line of Coffing utility tools.

Copies of this catalog will be furnished promptly by Coffing to those mentioning this review.



FOR THE WORK THAT MUST NOT PAUSE—



AND TO ADD MORE SPEED TO THE JOB—Gardner-Denver UM-99 Wagon Drills are easily transported over the roughest sites, wherever frequent moving is necessary. They are equipped to handle 6-foot steel changes, and they're adjustable for drilling in any desired position.

Today, the equipment used to advance important war projects must be dependable. And the dependability of Gardner-Denver Water-Cooled Portable Compressors is a matter of specific facts, not of mere claims. Here are some of the reasons why Gardner-Denver Air Compressors help your jobs go ahead without interruption or delay.

SUSTAINED PERFORMANCE—To assure consistent, year-round dependability for all your jobs, Gardner-Denver Portable Compressors are built with completely water-jacketed cylinders for constant load operation.

COOLER DISCHARGE TEMPERATURES—Gardner-Denver Portables run cooler—deliver cooler air, because they're water-cooled. Cooler air means less deterioration of air hose, fewer drill repairs, greater dependability.

LESS OIL CONSUMPTION—Because they're water-cooled, these portables use less lubricating oil, and that means substantial savings in your oil bill.

NO PAMPERING—Put Gardner-Denver Water-Cooled Portable Compressors to work on your Victory projects, and they'll deliver full output every day, in every season, under all weather conditions, at any altitude.

For the complete facts on Gardner-Denver Water-Cooled Portable Compressors and Gardner-Denver Wagon Drills, write Gardner-Denver Company, Quincy, Ill.

GARDNER-DENVER Since 1859



Finish the job quicker and save money with electricity.
Send for catalog describing generators and our complete line of portable poles for floodlighting.

E. B. KELLEY CO., Inc.
43-67 Vernon Blvd.
Long Island City, N. Y.

Repair Parts Value Doubled During Year

In a very interesting discussion of war production and the production of commercial tractors in its house organ "Cletrac Facts," the Cleveland Tractor Co., Cleveland, Ohio, reports that it is impossible for them to build all repair parts promptly for they are shipping several times the volume of parts they did a year ago. Everything that can be done is being done to get the materials necessary to build more repair parts and further to improve Cletrac service through dealers.

Both dealers and customers are urged to help by anticipating repair parts needs and by: 1. Supplying the proper priority with every parts order; 2. As-

signing a purchase order number to each order; 3. In case of inquiry through the dealer, referring to the purchase order number with the date of the order. In these war days when time is such an important commodity, every contractor and highway department, as well as every dealer, must be sure there is no mistake in his order when placing it so that unnecessary correspondence will be eliminated.

New Booklet on Bases For Roads and Runways

A new book entitled "Better Bases for Better Surfaces," dealing with the design and construction of bases for highways and airport runway pavements, has recently been announced by the

Solvay Sales Corp.

This book, which contains new information recently developed on base design and construction, condenses the information from recent reports which show the varying amounts of compaction and density necessary to assure ultimate stability of various types of graded aggregate bases. It also includes new information on methods which will both insure proper density and at the same time effect substantial savings in water and compactive effort. Other sections cover the treatment of bases for frost prevention, and specifications used in the construction of bases with various types of materials.

Copies of this book may be secured by interested contractors and engineers direct from the Solvay Sales Corp., 40

Rector St., New York City, by mentioning this item.

Quick Selector Catalog

This is the title of a recently revised 64-page catalog, issued by the Westinghouse Electric & Mfg. Co., to aid in and simplify the selection of many types of electrical equipment. The general subjects covered include switches, motor control and motors, panelboards, and multi and no-fuse breakers. New application data on the latest equipment in each of these groups are included.

A copy of this Quick Selector Catalog may be secured by those interested direct from Department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Penna.

An Indisputable CLAIM



BUCKEYE R-B Power Finegraders have brought into the paving picture one of the few major advances in methods that have been introduced since the first pavers were built. These one-man operated machines, riding on the forms, slice the grade to exact cross section eliminating nearly all hand labor, reducing the loss of yield to a negligible percentage, ending penalties for thin slabs and ending the problem of keeping the grade well ahead of the paver. There are no delays with an R-B Finegrader—they move fast even in rocky soil. Many are working ahead of two 34-E pavers. They'll leave any desired amount of fines for compacting by the roller. Depth of cut is adjustable by hydraulic lifts. Two models provide cutting widths from 10' to 25'. If you have a road or airport paving contract, R-B Finegraders will speed up the job and lower your costs plenty. One good job and the machine pays for itself. Full details in new Bulletin. Send for it and ask for name of nearest dealer.

No other existing equipment can prepare subgrade as quickly, cheaply and accurately as

a **BUCKEYE R-B POWER FINEGRADER**

BUCKEYE TRACTION DITCHER CO., Findlay, Ohio

Built by Buckeye

Convertible Shovels



Trenchers



Tractor Equipment



R-B Finegraders



Road Wideners



Spreaders





Steel-tired wheels replace rubber-tired ones on Littleford asphalt kettles, in accordance with WPB rulings, to conserve rubber.

Off with the New— And Back to the Old

Hansom cabs have returned to the streets of New York and Boston and the sale of equestrian equipment is said to be booming. While we do not expect to see horse-drawn construction equipment, we are turning the pages backward, as the accompanying illustration from Littleford Bros., Inc., 485 E. Pearl St., Cincinnati, Ohio, shows.

Pneumatic-tired wheels are being removed from Littleford asphalt and tar heaters, to comply with the rules and regulations of the War Production Board, substituting steel-tired wheels as shown on the far side of the kettle. We are advised that if contractors insist on rubber tires on kettles, rollers, brooms, or any other item, the WPB requires, first of all, that the order be covered by a priority A-1-k or better. Following this, the manufacturer files form PD-448 giving all of the information on the transaction, including the customer's name, address, preference rating, serial number, the reason why it is essential to have pneumatic tires and complete details as to the "end use" of the equipment.

While waiting for WPB to approve the release or reject it, shipment cannot be made under any circumstances. Littleford, as well as other manufacturers, is urging its dealers to make it plain to the customer who wants immediate delivery to buy the outfit on steel-tired wheels. Littleford reports that most of their wheels have Timken roller bearings and are interchangeable with pneumatic-tired wheels which will be supplied "After we help clean up the mess across the oceans".

A Report on the Ind. Highway Commission

A 40-page mimeographed report on the organization and functions of the State Highway Commission of Indiana, prepared by Lawrence H. Wendrich, has recently been published by The Institute of Politics, Department of Government, Indiana University, Bloomington, Ind. The study is a brief survey of the internal structure and division of duties of a department which the public at large knows only as the agency responsible for its roads. The basis of this study is a description of the organization and operation of the State Highway Commission first undertaken to furnish comparative data to the Highway Department

and Control, Division of Maintenance, and Division of Construction, and a short proposal for a recasting of several positions and a clarification of some of the organization as it now operates. The report concludes with a very careful study of the personnel system and an organization chart of the Department.

Copies of this report may be secured at 25 cents each from the Institute of Politics at Indiana University.

New PCA District Manager

R. W. Winters, for the past seven years District Engineer in charge of the Oklahoma City office of the Portland Cement Association, has been appointed District Manager of the Association with headquarters in Kansas City, Mo. He will have charge of the Association's work in Kansas, Oklahoma and Western Missouri. Mr. Winters is a graduate of the School of Mines, University of Pittsburgh, and joined the staff of the Association eight years ago, working in Kansas and Oklahoma.

This New book shows you hundreds of ways to **SAVE TIME and MONEY** in arc welded construction

"I keep a copy handy on every job we handle. Speeded up many a project with Hobart Welders. Hobart keeps my equipment in tip-top shape right on the job."

HOBART BROS. CO., Box CE-82, TROY, OHIO

HEIL SCOOPS give you HEAPIN' BIG LOADS—

...that pay extra dividends
in increased yardage —
every day on every haul

A Heil C16 Scoop, tracted by FD Cletrocs, hurrying an airport to completion "somewhere in the U. S. A."

No matter how big the job, or how tough the operating conditions—Heil's traditionally famous "built to take it" construction will see your job through "on schedule", without costly delays or service expense.

Experienced operators continue to be amazed at the way Heil Road Machinery establishes record after record in daily yardage moved — regardless of soil conditions.

Whatever your Road Machinery needs, The Heil Co. has a complete line of ruggedly constructed equipment designed to do the job dependably, quickly and economically—equipment that pays you extra dividends in increased production and decreased maintenance costs.

TURNS ON A DIME — Heil Hi-Speed Tractor-Scoop Combination turns and maneuvers effortlessly, and gives you faster, more profitable operation.

ROUGH AND TOUGH, or gentle as a lamb — Heil Hydraulic Trailbuilders and Bulldozers give you instant, positive control—for a gentle nudge or a powerful push.

BUILT TO TAKE IT—Heil "performance planned" bodies and hauls are ruggedly constructed for dependable, positive, long-life performance.

Carey Elastite
EXPANSION JOINT

Standard in Concrete Construction for 26 Years
ECONOMICAL and EFFICIENT
Asphalt Joint • Rubber Joint
Non-Extruding Expansion Joint
Plane Dowel Expansion Joint
Sub-grade Felt

THE PHILIP CAREY MFG. CO.
Dependable Products Since 1873
LOCKLAND, CINCINNATI, OHIO

THE HEIL CO.
GENERAL OFFICES: MILWAUKEE, WISCONSIN

Surface Treatment With Less Bitumen Used in Australia

Because of the possibility that for some time to come the quantity of bitumen available in Australia might be less than the minimum required to carry out normal re-treatments, an experimental length of light re-seals, comprising 22 different selections, was put down in 1941 and reported in *The Shire and Municipal Record* from the Annual Report of the Victorian County Roads Board of Australia. The work was carried out in good weather on March 31 and April 1 and 2, 1941, on the Princes Highway West, near Laverton, on a section of asphaltic concrete laid in 1926, presenting a hard surface free from excess of bitumen. The traffic along the section chosen was heavy, about 2,000 vehicles per 12-hour period.

Eight gradings of aggregate were used, four of the $\frac{3}{4}$ -inch or $\frac{5}{8}$ -inch maximum-size type, three being graded and one a "one-size" material. The other four gradings were of the $\frac{1}{2}$ and $\frac{3}{8}$ -inch maximum-size type, two being well graded, one badly graded, and one a "one-size" aggregate. Except on certain short portions where wet aggregate was deliberately used, care was taken to keep the stone dry.

For the four larger aggregates, binder at 0.24 and 0.18 U. S. gallon per square yard was used, while for the four smaller materials rates of application of binder of 0.18 and 0.12 gallon per square yard were tried. The aggregate initially removed by traffic on each section was carefully collected and weighed, to enable per cent loss by volume to be calculated.

An attempt is being made to record the gradual depreciation of each section by means of surface-texture prints. The following are tentative conclusions from the tests, which should be read with due regard to the conditions of the test, that is, (1) an existing non-porous smooth asphaltic-concrete surface, (2) good hard aggregate (3) heavy traffic, and (4) no sweeping back.

As to the success of the different gradings of aggregate, it was found: (1) The more "one-size" the grading of the aggregate, the greater is the uniformity of surface, and the greater is the possible economy in the use of binder; (2) If a graded aggregate is used, the better the grading through the intermediate sizes and the smaller the quantity passing about one-third the maximum size, the better is the resulting work. A study of the effect of the wet aggregate showed: (1) The use of wet aggregate can more than double the amount of "wipe off", or material swept to the side of the road by traffic; (2) The use of wet aggregate and a binder of too high a viscosity at the time of spraying can in combination increase the amount of "wipe off" by more than four times.

The effect of the rate of application of the binder was studied and reported as follows: (1) For light re-treatments by re-sealing, the greatest possible economy in the use of binder would be achieved by using a "one-size" aggregate of $\frac{1}{2}$ -inch maximum size. With an aggregate of this size on a smooth surface, an application of binder at the rate of 0.12 U. S. gallon per square yard, and on an average surface a rate of application of 0.15 gallon per square yard, could be used successfully with existing mobile sprayers; (2) For medium re-treatments by the process of re-sealing, the most economical result, from the point of view of the quantity of binder necessary, would be achieved by the use of "one-size" aggregate having a maximum size of $\frac{3}{4}$ inch. The rate of application of binder when applied on a smooth surface could be as low as 0.18 and on an average surface 0.204 gallon per square yard; (3) For medium re-treatments by the process of

re-sealing, using a well-graded aggregate of $\frac{1}{2}$ -inch maximum size, and not more than 10 per cent passing $\frac{1}{4}$ -inch, a rate of application of binder of 0.24 gallon per square yard would generally give a successful job.

The study of "wipe off" shows: (1) The lowest percentage of "wipe-off" is encountered with aggregates of the "one-size" type of grading amounting to approximately 10 per cent; (2) For aggregates of the same maximum size the maximum percentage of "wipe off" is met when poorly graded aggregates are used, this amounting to approximately 25 per cent; (3) When using well-graded aggregate the percentage of "wipe off" appears to increase with a reduction in maximum size. For $\frac{3}{4}$ -inch material, it was approximately 20 per cent and for $\frac{5}{8}$ -inch about 30 per cent.

Collect all your scrap iron and steel and turn it in to Uncle Sam. It takes half a ton of scrap to make a ton of new steel for war.



They Simplify JOB-PROGRESS!

STERLING Wheelbarrows provide simple, low-cost material-transport that assures practical job-progress. They need no skilled labor for successful operation . . . they can utilize ANY AVAILABLE MAN-POWER, and because they are the "Easy-Wheeling" barrows, they permit any man to do a better day's work, always. STERLINGs are veterans of long, successful service in fields of construction and throughout industry. Built to TAKE IT, 24 hours a day . . . you can depend on them NOW, as usual!

STERLINGs simplify jobs . . . Ask STERLING how, now!

STERLING WHEELBARROW CO., MILWAUKEE, WIS.

Look for this Mark of STERLING Quality



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★ ★ ★ CHICAGO PNEUMATIC NEWS ★ ★ ★

CP VIBRATORS ON 32 BIG DAM PROJECTS



↑ KNOCKING DOWN A BATCH at Cottage Grove Dam with CP Model 417 one-man type Pneumatic Vibrators. Note harsh, stiff mix, with 6-inch cobbles—convincing proof of the power and ruggedness of CP Concrete Vibrators, Pneumatic and Hicycle Electric.



SANTA FE DAM...CP 325→
Pneumatic Vibrators. Note coarse aggregate on top of mix—and smooth appearance of the vibrated section.



← FIRST BUCKET of concrete at Shasta Dam, July 8, 1940. The vibrators are CP 417, Pneumatic, ideal for batches up to 2 cubic yards.

THERE ARE 7 MODELS of CP Concrete Vibrators, Pneumatic and Electric, for mass and reinforced concrete; one-man, two-man ↓ types—powerful, low in maintenance.



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CONTRACTORS' EQUIPMENT
Air Compressors, Rock Drills, Pneumatic Tools,
Vibrators, Pumps, Electric Tools, Diesel Engines

High Gravel Fill All From Borrow

Scrapers Place Material
At Railroad Overpass on
Oregon Route 213 on the
Outskirts of Portland

By HENRY W. YOUNG

• TWO contracts were involved in a grade-separation project of the Oregon State Highway Commission near Clackamas on the southern outskirts of Portland, Ore., along the extension of 82nd Avenue, a part of the Cascade secondary state route 213. The two-lane reinforced-concrete structure, which passes over the railroad and a private road, was practically complete on September 1, 1941. Concrete box-type culverts were built for the accommodation of two small streams, one near each end of the structure. High gravel fills were placed to meet the grade of the structure deck 33 feet above the original ground level, requiring slightly over 200,000 cubic yards of embankment material.

Frank Watt of Portland had the \$26,000 contract for the structure, two small detour bridges, and the culvert immediately south of the structure. Roy L. Houck of Salem, Ore., was awarded a contract for \$97,000 for the fill and pavement and for the culvert to the north, which latter he sublet to Watt. The fill was made over part of the existing highway, the rest of the project being new location. When the fill work started, it was necessary to detour traffic over the Ambler Road, a distance of half a mile.

Watt started work on April 12, 1941, and began erecting the falsework for the overpass shown in the photograph, using 8 x 8 posts with 3 x 8 cross members and footed on 10 x 16 timbers extending crosswise. The length of the concrete structure is 210 feet, giving a 25-foot clearance and carrying a roadway 26 feet wide.

Gravel Borrow

With the structure in place and culverts built, work was begun on the fill which is 33 feet in height where it joins the structure. Gravel from a borrow pit was used. The fill is essentially all borrow and there was only about 6,000



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THE JAEGER MACHINE CO.
781 Dublin Ave., Columbus, Ohio



Erecting falsework for a reinforced-concrete overpass on Oregon Route 213.

yards of road bed excavation. The haul was comparatively short, the length of the project being 0.91 mile, and the gravel deposit lying adjacent to the north end. The deposit is owned by the state and consisted of gravelly material running very even, with the largest pebbles well under 4 inches. It was a downhill run from the pit onto the

grade, and when the latter was completed and the pit worked to a greater depth, it still was about on a level with the top of the fill.

Under these conditions, Houck, a firm believer in the economy of Carryalls, employed them for the bulk of the work on the fill. They were 15-yard self-load

(Concluded on next page)

Bulletin on Manganese Steel for Crusher Parts

Savings by reducing out-of-service time, repair and maintenance costs, as well as reducing the amount of critical material needed to keep equipment working efficiently, are the results of using manganese steel parts for crushers, grinders and similar heavy-duty units, according to a new bulletin recently issued by the American Manganese Steel Div., American Brake Shoe & Foundry Co., 398 E. 14th St., Chicago Heights, Ill.

This bulletin contains not only a description and illustrations of the various crusher, grinder and pulverizer parts available in manganese steel, but also a discussion of what manganese steel is, and why its properties are particularly important in the conservation of materials necessary to the Victory effort.

Copies of this Bulletin No. 642-C may be secured by interested contractors and engineers direct from the manufacturer by referring to this item.



“Why should I? I’m a truck with a Cummins Diesel — one of ten used by the Hinman Bros. Construction Company of Pittsburgh and Denver on the Letterkenny Ordnance Depot and Arlington Housing grading jobs. Altogether, we’ve gone 100,000 hours without an overhaul since we changed to a certain oil that eliminates sludge trouble. We keep going and feel fine because we lead clean lives! ”

“Now — tough going’s easy for me. I’m a power shovel with a Waukesha-Heselmann Diesel. Hinman operates two of us on this same job, and we total 20,000 hours without an overhaul. Know why we don’t bog down? Because we use the same oil — and it stops ring-sticking cold. It keeps us going strong! ”

“Rest? For what? This heat doesn’t bother me. I’m one of the 22 pieces of Hinman Bros. equipment with Caterpillar Diesels. All told we’ve gone 220,000 hours without an overhaul. Sure it’s hot, but we use that oil too — and it sure sticks to the hot spots, so we get along swell! ”

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And if YOU want to keep going,
old fellow, do as we do....
use RPM DELO! ♫

RPM DELO is marketed under the following names:
RPM DELO • Caltex RPM DELO • Kysco RPM DELO
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CONCENTRATE

Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your vicinity





A Jaeger pump and large hose handled the "river diversion" during the construction of the north culvert.

Culvert Construction On Overpass Approach

(Continued from preceding page)

ing units operated in tandem by a Caterpillar D8 tractor. Three or four rigs were operated most of the time. In this way, all the fill was completed to the north end of the structure and on grade with the roadway. The short stretch of fill at the south end was then made by trucks running on the completed part of the fill and over the structure.

Culvert Construction

Watt built the culvert immediately south of the crossing first. It is a double concrete box, each half being 5 x 5 feet, to handle the flow of a small spring-fed creek. A diversion ditch was dug and the work done under fairly dry conditions. Just as it was completed, however, high water came and partially filled it, so that the forms, when taken down, were floated out, a piece of navigating work not altogether displeasing to those who had expected to pack the lumber out.

The other culvert, a few hundred feet north of the crossing, was not put in until later. It is a 7 x 6-foot concrete-box type, 126 feet long. At the time it was being built, there was not much more than a trickle of water in the stream it is to carry. Watt made his "river diversion," using a Jaeger Model 4XP pump, operated by a Wisconsin Type AC4 gasoline engine, which delivered the flow through a large hose to the downstream end. At that point, a similar but somewhat smaller unit was utilized to take up the seepage.

Concrete pavement 22 feet wide with rock shoulders will be placed on the completed grade. This project eliminates a main line Southern Pacific Railroad crossing with a bad accident record.

Change in Wire Sizes For Aggregate Screens

There has been a slight change in the wire sizes for mineral aggregate production screens in sizes of clear square openings ranging from $\frac{1}{8}$ to 4 inches. This revision is in Simplified Practice Recommendation R147-33, on wire diameters for mineral aggregate production screens. The original recommendation, drafted with the aid of the Division of Simplified Practice of the National Bureau of Standards at a general conference of all interests in 1932, reduced the variety of wire diameters for openings from $\frac{1}{8}$ to 3 inches by approximately 75 per cent of their former number. The recommendation was reaffirmed in 1936, and again in 1940.

The revised schedule, which became effective June 30, 1942, adds wire diameters for openings in the range from 3 to 4 inches, but adds only one new wire diameter, 1 inch, to those already listed.

Until printed copies of the recommendation are available, mimeographed copies may be obtained free from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

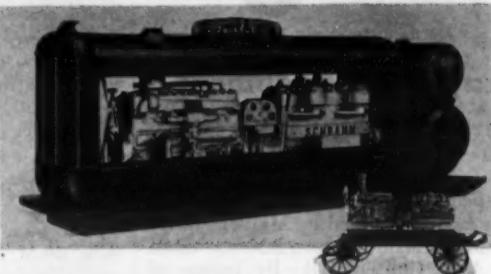
New Link-Belt Chief Engr.

William W. Sayers, who has served Link-Belt Co., Chicago, Ill., as Chief Engineer since 1925, has been appointed Consulting Engineer. In this newly created position, he will continue to deal with patent matters and be available for consultation where his extensive knowledge of the company's engineering problems will be helpful.

Richard F. Bergmann, who had been assistant to Mr. Sayers from 1933 to 1936, when he resigned to become Chief Engineer of Rayon Machinery Corp., Cleveland, Ohio, has returned to Link-Belt and has been appointed Chief Engineer with his office at the executive headquarters, 307 N. Michigan Ave., Chicago.

Easy to Start— Hard to "Stop"

From the big 420-cu. ft. actual air compressor to the versatile little 20-cu. ft., every SCHRAMM compressor is a compact package of power—always ready to start at the touch of a button; yet never ready to quit on the toughest jobs. Users have found that SCHRAMM all-weather compressors incorporate advantages that assure them of a dependable source of air power with a minimum of attention or servicing.



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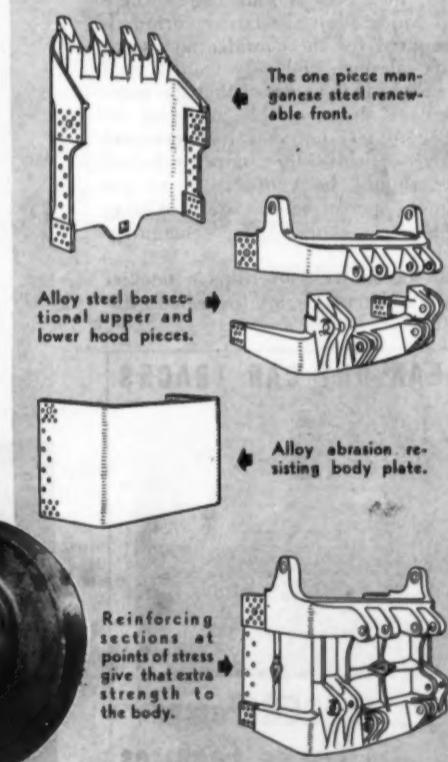
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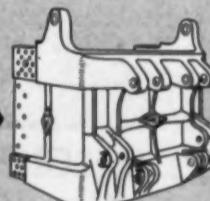


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tional upper and
lower hood pieces.



Alloy abrasion re-
sisting body plate.

Reinforcing
sections at
points of stress
give that extra
strength to
the body.



members (see illustration) to make an exceptionally strong dumper unit. Investigate PMCO Welded Dippers for added yardage capacity on your next shovel.

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Established 1880
4710 West Division Street, Chicago, Illinois



The Jiffy spray bar.

Spray Bar Attachment For Asphalt Kettles

A new Jiffy spray bar for use with any tar or asphalt kettle already equipped with a power spray has recently been developed by Marvel Equipment Manufacturers, Inc., 224 So. Michigan Ave., Chicago, Ill. By means of this new attachment, any standard kettle can be transformed immediately into a pressure distributor, merely by connecting a few valves and mounting the spray bar. As a result, a three or four-barrel kettle can be put to work patching and repairing access or secondary roads or airport runways, releasing larger and more costly equipment for the bigger jobs, and effecting considerable economies for overburdened budgets, according to the manufacturer.

This spray bar can also be used for sprinkling roads, oiling, and for spraying roadsides to kill weeds. Further details on the Jiffy spray bar may be secured by those interested direct from the manufacturer or from this magazine.

Technical Pump Data Available to Readers

A varied series of both elementary and advanced technical data on the selection, installation, operation and maintenance of all types of centrifugal, reciprocating and rotary pumps have been made available to pump operators as a special wartime service by Goulds Pumps, Inc., Seneca Falls, N.Y. These Pump Application Sheets were originally prepared for the confidential use of Goulds salesmen and vary from 2 to 8 pages each. It is expected that the more elementary sheets will be of great assistance in training new inexperienced employees, while the more technical sheets should help operators to get maximum performance from existing equipment, regardless of its manufacture.

The sheets, with an 18-page booklet Pump Fundamentals, are furnished with-

out charge in a durable file folder containing an extra pocket for the recipient's own notes and hydraulic data. From 6 to 14 sheets are placed in each folder, depending upon the type of information deemed most useful to the recipient. Additional copies of individual sheets, or of the complete folder, will be furnished on request, without charge, to readers of CONTRACTORS AND ENGINEERS MONTHLY. Your requests should be addressed to Dept. 20, Goulds Pumps, Inc., Seneca Falls, N.Y.

Power Grader Attachments

Two attachments to team up with the A-W 99-M power grader are described and illustrated in Form AD-1955 recently issued by the Austin-Western Road Machinery Co., Aurora, Ill. The roller attachment is particularly adaptable for patching or consolidating shoulders, stabilizing soil, resurfacing and similar operations, while the bulldozer extends the service of the grader far beyond the usual field of activity of

a power grader.

Copies of Form AD-1955 will be sent free on request by Austin-Western.

New Traffic-Control Book

A new pocket-size 83-page book "Uniformity in Highway Traffic Control" has recently been published by The Eno Foundation for Highway Traffic Control, Inc., Saugatuck, Fairfield County, Conn. Prepared by William Phelps Eno, founder and Chairman of the Board of Directors of the Eno Foundation, the book is devoted largely to city traffic problems. However, the chapters devoted to uniform direction and distance signs and on uniform traffic engineering with reference to construction and regulations for war purposes will bear particular study by state and county highway authorities.

This book is available from the Foundation at \$1.00 per copy and at special reduced rates in quantities to police departments, traffic engineers' schools and traffic students.

Protection for Drivers

Who Clean Truck Bodies

On a construction job, a truck driver was fatally injured when struck by the falling body of a 1½-ton batch truck equipped with an hydraulic lift. The drivers were required to clean the truck bodies two or three times during each shift by raising the body and raking and scraping it from the inside. Sometimes the bottom of the dump body, when raised, was hammered to loosen damp materials.

According to *Construction Safety*, this driver accidentally tripped the release lever of the hydraulic cylinder, causing the body to fall rapidly, and he was pinned between the body and the truck. Employees had been instructed to block the body to keep it from falling, but it was not done in this case. Here is another illustration of the fact that safety education must be continuous and supervision constant.

Buy U. S. War Bonds regularly.

CORRECT TIMING FOR SLAB FINISHING

Concrete airport runways and aprons, require accurate surface finish for smooth take-off and landing. The Koehring Longitudinal Finisher finishes slab surface accurately by the mechanical method. The right time to finish the concrete slab surface is after the initial set has occurred. Manual finishing is not always correctly timed because of the physical limitations of the manual method. Koehring Finisher operates efficiently at any distance behind the paver, as determined by the initial set. Be sure, have accuracy, with the Koehring Longitudinal Finisher.

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Longitudinal Finisher operates accurately at all times, and at any distance behind the paver depending on the initial set.



The Quick and Easy Way
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RAPID PAVEMENT BREAKER MACHINE

Also used in breaking out roads, floors, walls, heavy foundations, trenching and bridges.

Write for Information

CONCRETE CUTTING CORP. OF AMERICA
687 Degraw Street
Brooklyn, N. Y.



HEAVY-DUTY CONSTRUCTION EQUIPMENT

Grading and Drainage Project on R. I. Route

(Continued from page 25)

boom. The material was all cast and wasted. The original item of 13,700 cubic yards of swamp excavation was considerably exceeded.

Fills Topped with Borrow

A 1½-yard Marion and a 1¼-yard Northwest, operating as shovels, were used in a large local borrow pit of fairly porous material to supply the topping for the large fills. On fills up to 20 and 30 feet, which were numerous on the job, the base consisted of rock from the numerous large rock cuts, and this was topped off with the porous borrow. The shovels loaded to four Euclids, two of which were 10-yard gas-powered units and two 14-yard units equipped with 150-hp Cummins diesel engines. As the haul lengthened, two more "Eucks" and four Autocars were added to the fleet. On the fills the material was spread by a D8 tractor with a LaPlant-Choteau bulldozer, two D7's with LeTourneau bulldozers, a D6 tractor with a LeTourneau bulldozer, and the grade was finished by a No. 112 Caterpillar power grader.

Quantities

The major quantities on which the contractor's bid of \$158,555.25 for the completion of this Rhode Island grading and structures project was made were as follows:

Clearing and grubbing	22 acres
Isolated trees	25
Earth excavation	53,850 cu. yds.
Swamp excavation	13,700 cu. yds.
Trench excavation, earth, 0 to 5 feet	2,700 cu. yds.
Trench excavation, earth, 5 to 10 feet	30 cu. yds.
Rock and ledge excavation	57,900 cu. yds.
Trench excavation, ledge, 0 to 5 feet	1,800 cu. yds.
Trench excavation, ledge, 5 to 10 feet	12 cu. yds.
Removing existing masonry structures	5 cu. yds.
Borrow outside of location	158,100 cu. yds.
Selected borrow for bridge site	6,000 cu. yds.
Stripping and piling loans	6,680 cu. yds.
Gravel foundation	56 cu. yds.
Binch subdrain	2,350 ft.
Removing 12-inch cast-iron pipe culvert	38 ft.
Furnish and lay 12-inch pipe culvert	966 ft.
Furnish and lay 18-inch pipe culvert	708 ft.
Furnish and lay 24-inch pipe culvert	248 ft.
Furnish and lay 30-inch pipe culvert	100 ft.
Furnish and lay 36-inch pipe culvert	190 ft.
Furnish and lay 48-inch pipe culvert	33 ft.
Furnish and lay 12-inch plain-concrete pipe culvert	810 ft.
Furnish and lay 18-inch plain-concrete pipe culvert	57 ft.
Furnish and lay 24-inch plain-concrete pipe culvert	14 ft.
Furnish and lay 36-inch plain-concrete pipe culvert	56 ft.
Furnish and lay 48-inch plain-concrete pipe culvert	16 ft.
Catch basins for partial drainage	8
Cement concrete masonry	243 cu. yds.
Steel bar reinforcement	19,150 lbs.
Remove and rebuild stone walls	3,850 ft.

Drainage Structures

The largest drainage structure on the job was a 6 x 5-foot box culvert, 205 feet long, which was poured by Rex truck mixers mounted on Autocars operating from the central batching plant of the contractor in South Providence, R. I. Gammino used a Model 25 Northwest backhoe in excavating the trenches for the large amount of pipe installed for drainage, and a Lorain 40 truck crane

USE RIGHT BUCKET FOR THE JOB



Hayward makes all four—clamshell, dragline, electric motor, orange peel. A Hayward recommendation is unprejudiced.



THE HAYWARD CO., 32-36 Dey St., New York

Hayward Buckets



C. & E. M. Photo

The men who bossed the Louisquissett Pike job. Left to right, F. P. Holden, Resident Engineer for the State; and for the contractor, Gunnar A. Craft, Engineer; Daniel D'Onfro, Superintendent; and Chappi Santilli, in charge of drilling and blasting.

mounted on a Mack truck for clean-up. In addition there were a Ford service

truck for gasoline and oil and three Ford pick-up trucks, with a total of

about 25 pieces of equipment on the job during most of its active period.

Personnel

The 2.07-mile grading and drainage project on Rhode Island Route 146 was awarded to M. A. Gammino Construction Co., Inc., of Providence, R. I. On the contract Daniel D'Onfro was Superintendent, Gunnar A. Craft was the contractor's Engineer, and Chappi Santilli was in charge of drilling and blasting for the contractor. For the Rhode Island Division of Roads and Bridges, F. P. Holden was Resident Engineer. This job was started the latter part of May, 1941, with a completion date of December 1, 1941, which was met by the contractor in spite of delays early in the project.

"There are two freedoms: the false, where a man is free to do as he likes; and the true, where a man is free to do as he ought." Remember this, if safety rules sometimes seem irksome. Follow them anyway, and work toward true freedom.

"An outstanding record" on 385 pieces of equipment

CARS • TRUCKS • CRANES • SHOVELS • DIESEL AND GAS TRACTORS

Dear Sirs, Louisville, Kentucky
February 24, 1942

Re: Macmillan Petroleum Corporation

Dear Sirs, I am enclosing a copy of the letter from Mr. J. W. Gutermuth, Superintendent of Roads and Excavation and Equipment for Whittenberg Construction Company, Struck Construction Company, George M. Eady Company, and Highland Company, Inc. He "has been directly responsible for the maintenance and repairs of equipment at Fort Knox for the past fourteen months," he writes in February, 1942.

In previous jobs, he says, some oils were good in some types of equipment "and not so good in others." His experience with Macmillan RING-FREE was reason enough for him to use it on \$750,000 worth of equipment at Fort Knox.

On some of this equipment, the factory recommends overhauls at about 2,000 hours. But—

"After fourteen months of day and night operation," continues Mr. Gutermuth, "various kinds of our equipment had a record of more than 3,300 hours without a single motor repair, due to the perfect lubrication of Macmillan RING-FREE Oil."

When a factory representative inquired what oil had been used, Mr. Gutermuth replied:

"Only Macmillan RING-FREE Oil could have performed such an outstanding record."

Whatever your equipment may be, write us, so that Macmillan RING-FREE can do for you what it is doing for others.

MACMILLAN PETROLEUM CORPORATION
50 West 50th St., New York
624 S. Michigan Ave., Chicago
530 West 6th St., Los Angeles

MACMILLAN RING-FREE MOTOR OIL

Well-Planned Set-Up Speeds Paving Job

(Continued from page 2)

mum of fifteen. The batch weights, including moisture in the sand, for a 34-E paver were:

Coarse aggregate	1,656 pounds
Medium stone	1,576 pounds
Sand	1,745 pounds
Cement	752 pounds

Preparation for Pouring

There was no prepared cushion course on top of the subgrade as all of the borrow for raising the grade was from sand pits. Preparing the grade ahead of the Ted Carr form trench grader were a 2-yard rotary scraper pulled by an RD6 tractor and an 8-foot pulled grader. The 9-inch Metaforms were strung out along the shoulder by the stripping crew and one man was kept busy cleaning them, ready for the form-setting crew.

Both grade and form setting were in charge of the grade foreman who had one lineman, four men cleaning the form trench, one form setter, two helpers, and a roller man operating a converted 5-ton tandem steam roller running on the fine grade between the forms ahead of a Buckeye R-B power Finegrader which pulled a planer and checking template. These were scarcely necessary as the clean cut of the Finegrader through the sand and clay in various combinations left the subgrade accurate. Inasmuch as neither batch trucks nor paver operated on the subgrade it held its shape and compaction right up to the pouring.

A somewhat unusual activity of the man who usually sprinkles the grade to prevent absorption of water from the concrete was the fact that he sprinkled just as much outside the forms as he did inside. There had been no rain for three or four weeks on this job and by watering the grade it prevented the batch trucks raising a lot of dust when they ran on the 30-foot boulevard strip between the two 22-foot paved sections.

Back of the R-B Finegrader a foreman and two laborers checked and realigned the steel road forms and then they were oiled by one man using a wide brush.

The Joints

The Indiana standard for the spacing of expansion and contraction joints is 120 feet for the former, with the contraction joints 40 feet apart between. The expansion-joint assembly consists of $\frac{3}{4}$ -inch non-extruding fiber placed in two 11-foot sections with 2-foot long $\frac{3}{4}$ -inch round dowels spaced 12 inches apart and supported by pressed-metal stands exactly $3\frac{1}{2}$ inches from the center of the dowel to the subgrade. The

pressed-metal support is topped by a tube 2½ inches long into which the dowel is slipped and then the caps and alternate ends of the greased dowels are slipped over the outside of the tube, giving a double protection to the end of the dowel for expansion. The pressed-metal supports are welded to a 2-inch metal strip which rests on the subgrade. A 1-inch equal-leg cap is placed over the top of the premoulded material, wired to the material, and greased. The contraction-joint assemblies are identical with the expansion joint except that the premoulded material is omitted and there are no caps on the dowels but they are greased for the full length as are the expansion joint dowels.

One expansion or contraction joint in about every 1,000 feet of concrete is checked after finishing operations are completed by shoveling out the concrete above the dowels and checking each one with a level. Even before concrete is poured, the assembly is checked by a box truss set on the forms and with specially adjusted bolts set to touch the top of the dowels. Where the dowels are low, small pieces of roofing paper are inserted under the supporting strips to bring the dowels to the proper elevation of $3\frac{1}{2}$ inches from the center of the dowel to the subgrade. Even with all this care, it is remarkable that the dowels do remain in as good condition as they are found, for with this checking only one dowel or at times two in an assembly is found to be at all out of level.

In watching the operation it was noted that, after the contraction and expansion-joint assemblies had been completed ahead of the paver, the man who was responsible for the paver hose frequently dropped it rather heavily on the assemblies which certainly must have

caused some slight displacement in spite of the sturdiness of the dowel-supporting frame of pressed metal.

The two men who were kept busy setting all of the joints placed a heavy notched plate with handles over the expansion joints just ahead of pouring. This plate was equipped with loops for driving five pins to hold it rigidly during the pouring of the concrete. It was removed just after the finishing machine had passed over the joint.

Around the Paver

Two men at the paver took care of sprinkling the grade, handling the paver hose and emptying the batches from the 2-batch trucks into the skip of the 34-E MultiFoote paver where the batch received a full 60-second mix. Water for the paver was furnished by a Gorman-Rupp triplex pump from a gravel pit located north of the job near its center. Instead of using the paver winch to pull the strike-off for placing the welded reinforcing fabric $2\frac{1}{4}$ inches from the top of the slab, the strike-off was pushed by the Jaeger-Lakewood 2-screed finishing machine which then went back and prepared to make two runs over the top course of concrete. Six puddlers worked in front of the strike-off and the front screed of the finisher when working on top and three of them went out on the dry subgrade and picked up the fabric to carry it in for placing. Beneath the fabric, tie bars 4 feet long and $\frac{5}{8}$ inch-round deformed were placed 5 feet apart across the center joint by the puddlers.

Using an 8-bag batch with bulk cement, the paver laid 2.73 linear feet of 9.7-9-inch section 22 feet wide per batch and poured an average of 125 feet per hour. The concrete had a slump of

(Concluded on next page)

Turn In All
YOUR SCRAP
It'll Shorten
THE WAR

LET'S FACE THESE FACTS: It takes about a half-ton of scrap steel to make a ton of new steel—for ships, trucks, tanks, and guns. Scrap steel speeds production. Waste materials—scrap metals, rubber and all the rest—are needed for the war industry. The demand is great, the supply dwindling.

YOU CAN HELP: Check your worn-out or obsolete equipment. If it cannot be used, why not scrap it? Collect worn-out tools, old pipe, structural and other useless material, and turn it over to the scrap dealer promptly. Urge your business associates to turn in their scrap as fast as it can be collected. (All scrap steel collected will be purchased by the steel industry at the government-controlled price.) Also encourage your employees and friends to collect all their old rubber and discarded metal household equipment and get it to a local salvage committee, charity or junk dealer.

A JOB FOR EVERYONE: Collecting scrap materials is a job that no one group can do alone. Every pound turned in will help shorten the war. It's a job that every citizen, every company, and every industry with a stake in America's future must share in doing—today and every day for the duration. The Armco Drainage Products Association, 795 Curtis St., Middletown, O.



This advertisement is in support of the Salvage Program of the Bureau of Industrial Conservation, the War Production Board.

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GEARED
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ALL STEEL HAND MOIST

SEATTLE, U.S.A.

COMPACT—POWERFUL—SAFE
"For use where power is not practical or available"
Manufactured in 2, 5 and 15-Ton Sizes.
For capacity comparison, $\frac{1}{4}$ " cable used:
2-Ton "Lightweight" 75 ft.
5-Ton "General Utility" 250 ft.
15-Ton "Triple-Gear" "Special" 1300 ft.
Patent instant gear change and positive
internal brake that never fails, and will
lock road. Price, f.o.b.
Gear Ratios Weight Seattle
2-Ton 4, & 22 to 1 60 lb. \$ 50
5-Ton 4, & 24 to 1 110 lb. \$ 75
15-Ton 4, 19 & 169 to 1 680 lb. \$250

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ature and List of Dealers in Principal U. S.
Cities and Foreign Countries—Gaily Mailed

CONTINENTAL BULLETIN

WORKING UNDER PRESSURE

Every day—almost every hour—brings new problems in the war production program. More and more goods must be turned out—often with less material to work with. Almost every manufacturer has the job of coming through on time so that other war industries are not thrown off schedule.

That takes plenty of sweat in the shop and constant good planning by the management. Ingenuity and resourcefulness are at a premium as never before—for America is again showing its native genius to solve the impossible problems almost as fast as they arise. This is the way the war will be won, and even though it entails temporary sacrifices, it is a small price to pay for Victory.

THE HAND OF THE SPECIALIST IS OFTEN
REVEALED IN LITTLE THINGS
"of BIG importance"

Finishing
Ind.

(Continued)

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CONTRACTORS AND
ENGINEERS MONTHLY

470 Fourth Avenue, New York

Enclosed is my remittance of \$2 for the next twelve issues of CONTRACTORS AND ENGINEERS MONTHLY.

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N. B. A two dollar bill, check or postage stamps will be entirely acceptable.

Finishing and Curing Ind. Concrete Paving

(Continued from preceding page)

2½ inches, the specifications permitting a variation between 1 and 3 inches.

The Finishing

The Jaeger-Lakewood finisher carried a belt at the back which gave the surface its first trowel finish. After the first pass of the finishing machine, the joint setters came back and removed the bulkhead, after which a White straddle vibrator was pulled across the joint. The strike-off pushed by the finishing machine was carried on two wheels on each side and each was equipped with a cam so that the front or rear wheel or both could be raised as it passed over a joint. The front wheels only were raised when passing over a contraction joint, but when passing over an expansion joint both wheels were raised.

The finishing machine was followed by a Cleft-Plane machine which set a continuous strip of preformed material 2½ inches deep and 1/16 inch thick down the center of the pavement. A toothed cutter at the back of this machine was pressed into the concrete by throwing a lever to cut the dummy joints over the contraction-joint dowel assemblies. This was followed by a Koehring longitudinal finisher. The last finishing operations were done by hand, including two finishers who handled 10-foot aluminum drag straight-edges followed by a hand-operated belting machine which carried a ¾-inch inside diameter garden hose attached to the frame at each end in front and forming a catenary as it was pulled over the surface ahead of the belt. This helped to strike off any laitance ahead of the final belting. The same hand finishers did the first edging at the side of the slab.

The two joint finishers cut the joints, edged them, did the final edging at the sides, and gave the slab its non-skid broom finish.

Cured with Straw

The curing of the slab was done by subcontract. The first operation was the placing of burlap on the slab as soon as the surface water had disappeared after brooming. This was done with wet burlap from a rolling bridge, the burlap being left on overnight. Then a crew equipped with several hay trucks placed 3 inches of wet straw on the surface which remained on and was wet continually by three men using hose from the paver line for a period of seven days. One man was also kept busy all the time wetting down the burlap.

Personnel

The contract for FAP 6B (3) for grading, structures and two 22-foot concrete pavements 4.395 miles long on U. S. 40, extending from ¼ mile east of the Clay-Putnam County line to Manhattan, Ind., was awarded to R. McCalman, Inc., of Danville, Ill., on the recorded low bid of \$481,621.56. For the contractor, W. F. Slattery was Superintendent, and P. L. Mayrose was Project Engineer for the State Highway Commission of Indiana.

**TARPAULINS
ROAD MATS
WINDBREAKS**

Contractors' Supply Dealers in every state sell the Fulton line. Specify SHURE-DRY and FULTEX Tents, Tarpsaulins, and Windbreaks—anything made of canvas. Also Fulton Road Mats and Burlap. Fulton products are good and prices are right. If you don't know what you want, write for catalog, samples and price list.

Fulton Bag & Cotton Mills
Manufacturers Since 1870
ATLANTA ST. LOUIS DALLAS
MINNEAPOLIS NEW YORK NEW ORLEANS KANSAS CITY, MO

write for prices



C. & E. M. Photo
Setting continuous center joint with a Cleft-Plane machine, using a roll of 2½-inch preformed material on the McCalman contract on U. S. 40 east of Brazil, Ind.

Safety Goggle Bulletin

Universal safety goggles for use in chipping, grinding and welding operations are described and illustrated in

bulletin DS 16.52, copies of which may be secured direct from the Universal Power Corp., 4300-2 Euclid Ave., Cleveland, Ohio.

A variety of models is available, to

meet different job needs and to suit the wearer's special requirements. All are of sturdy construction, designed for comfort and maximum safety from sparks, chips, and the dangerous rays from welding.

Portable Equipment For Black-Top Roads

The importance of maintaining all bituminous surfaces in the very best condition under present wartime economy can not be stated too forcefully. Highway surface maintenance must be carried with the minimum of manpower, and the equipment available.

The full line of Standard bituminous distributors, trailer oilers, asphalt and fuel oil heating and storage tanks, as well as portable retorts and boilers for heating tank cars are described and illustrated in considerable detail in Bulletin No. 514 issued by Standard Steel Corp., 5001 Boyle Ave., Los Angeles, Calif. This bulletin will be mailed free on request to those mentioning this item.

**What is "AIR CUSHION"
in a Paving Breaker?
How Does it Improve the Machine's Action?**

Illustrated at the left is the Cleveland C9 82-Pound Paving Breaker, one of the line of four. The others are the C7, weighing 88 lbs., the C11, 56 lbs., and the light but powerful little C10, 32 lbs.



Among users of Paving Breakers there has been considerable discussion of late on the subject of the Air Cushion, an excellent feature which has always been used in Cleveland Paving Breakers ever since the earliest design, twenty years ago.

The sectional view shown here is typical of Cleveland paving breaker design. Note the forward air supply port, (L) and the hammer, or piston, (P). When the forward edge of the hammer passes the port (L), compressed air is trapped in the front end of the cylinder at (D), effectually preventing the hammer from making metallic contact with the front end, the tappet bushing, (B). It is easy to understand that this prevents breakage of parts, including the side rods, which must stand the strain of blows struck on the front end when the hammer over-runs, due to drawing the tool back from the work, and when no Air Cushion is provided.

Any one, or all types of Cleveland Paving Breakers gladly demonstrated at your convenience. Select the one that does your work best.

BRANCH OFFICES

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Winchester, Ky.			Wallace, Idaho

CANADIAN DISTRIBUTORS

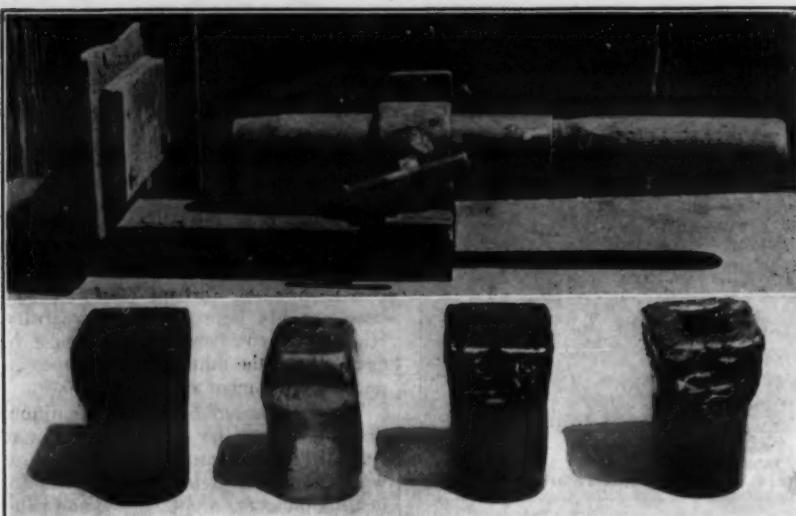
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LEADERS IN DRILLING EQUIPMENT



Welding and hard-facing worn sheepsfoot tamps greatly extend their service life.

Sheepsfoot Tamers Rebuilt by Welding

Another story of how a contractor is stretching the service life of his equipment comes to us from California. The tamping feet of sheepsfoot rollers used on Santa Fe Dam wore out rapidly, requiring frequent changes to maintain the specified tamping area. After discarding several sets of sheepsfoot tamers, the contractor decided to have a local shop reclaim 560 tamps by welding and hard-facing.

In order to save time and effort and make the rebuilt tamps uniform, the shop owner built a jig so that the tamps could be slipped into position and rebuilt against a copper form. They were rebuilt to within 3/16 inch of specified size with Stoody high-carbon electrodes and then given a final overlay of coated Stoody self-hardening electrodes. The lower photo shows successively a new tamp, one worn down in service, the same tamp after rebuilding with the high-carbon electrode, and finally the tamp after the hard-facing metal had been applied, while the photo at the top shows the jig used in rebuilding the tamps.

The reclaimed set of tamps gave service equal to four sets of unprotected tamps, yet the cost of the reclaiming operation was 10 cents per tamp less than the cost of replacements. The savings provided by one application amounted to something like \$1,100.

The very helpful 14-page bulletin of "Pointers" on rebuilding and hard-facing construction equipment with Stoody hard-facing alloys is available from the Stoody Co., 1134 W. Flauson Avenue, Whittier, Calif., to those mentioning this item. The booklet takes up each part of a piece of construction equipment subjected to unusual wear, states the type of rod and amount required, the welding time, the benefits of hard-facing, the welding procedure, and concludes with explanatory drawings.

Book on Camouflage Has Important Data

The subject of industrial camouflage has a much greater significance to most of the manufacturers represented in our advertising columns, because of the number of plants which have been converted to war production, than to contractors and highway departments. Still, along our coasts are concentrations of essential highway construction and maintenance machinery that for the duration of the war is practically irreplaceable. These must be housed in buildings not readily visible to attacking planes.

Readers interested in this subject will find much aid in the study of this technique in the "Industrial Camouflage Manual" prepared at Pratt Institute, Brooklyn, N. Y., under the direction of Konrad F. Wittmann, and published by Reinhold Publishing Corp., New York City. Price \$4.00.

Relation of Utility Lines to Roadsides

At the Ohio Highway Development Conference, George D. Blair, Chief Forester, Consumers' Power Co. of Jackson, Michigan, who is a recognized authority on the care of trees in relationship to electric utility lines, passed on to those attending the conference some points in roadside development based on his 20 years' experience.

For best results in providing service, Mr. Blair states, the location of utility structures should be coordinated with all other highway uses, present and future, rather than placed in any spot which happens to strike the fancy of utility men or others. This is a workable approach, as it recognizes that overhead lines are but one of the public facilities provided for on street and highway rights-of-way, and that in the final analysis travel, drainage and safety must come first.

Many utility companies would welcome constructive suggestions and aid from street and highway engineers in achieving roadside improvement and, in Mr. Blair's opinion, highway representatives have a right, morally when not legally, to expect full cooperation from the utility companies on all matters pertaining to the location and maintenance of utility structures.

When new or additional highway right-of-way is secured, it should be sufficiently wide to accommodate all needs, with some attention to the future. In determining this, roadside development engineers should play an important part along with highway designing engineers and maintenance men. If this is done, followed by coordination of proper design of the travel way, bridges, drainage, and roadside, the foundation for many years of useful adequate service

to all interests of the public is assured. During design, provision can be made and space allocated for both overhead and underground utilities, providing an orderly arrangement for all highway facilities. This orderliness reduces physical conflicts along the right-of-way. The reason for much of the congestion on many roadsides today is that too much has been placed in too little space. If this condition is avoided in the planning and construction of new roads, then and only then can full roadside development to protect and maintain highway investments and serve the general public be carried out.

America today finds itself the key nation in the greatest war in history. No task is too great to face, no job too small to do. Disposal of surplus materials, like the handling of scrap, plays an important part in our war effort. All is needed. Remember, for want of a horseshoe nail a kingdom was lost.

Andrew H. Phelps, Vice Pres.
Westinghouse Electric & Mfg. Co.

THE MOST IMPORTANT UNIT FOR AIRPORT RUNWAY CONSTRUCTION

Ariens
Aggmixer



Wherever there is mixed-in-place construction such as soil-cement, bituminous, etc.



IT DOES THE JOB THOROUGHLY, RAPIDLY, AND ECONOMICALLY

The AGGMIXER operates with other general purpose road equipment—from power take-off shaft of any suitable tractor—easy and safe to operate. The swirling chopping action of the AGGMIXER tines does a thorough job of mixing—wet or dry. Illustrations above show use on airport runway construction. Send for job facts now.

ARIENS COMPANY,
BRILLION, WISCONSIN

Cut MIXING Costs

Low cost production is important and essential to the successful contractor. H & B Bituminous Mixing Plants, both portable and stationary types, are designed with this problem foremost in mind. That the solution has been found is evidenced in the large proportion of Hetherington & Berner equipment to be found on the job today.

Your Inquiries Are Solicited



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ENGINEERS AND MANUFACTURERS

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C. & E. M. Photo
A pair of CMC pumps unwatered the cofferdam at Pier 6 of the Cedar River Bridge, near Mt. Vernon, Iowa.

Pile Driving Hard On Iowa Bridge Job

(Continued from page 1)

which was reached at a depth of 60 feet. With this information it was assumed that sand existed in approximately the same depth across the entire river bed for the length of the bridge, a distance of 995 feet, and specifications were written requiring a 30-foot penetration for the oak piles which furnished the foundation for the footings. The reason for this specified penetration was that if the river bed were all sand for a 60-foot depth, at least a 30-foot penetration would be required to insure stability of the structure because of possible scour.

What the Contractor Found

From the very start, the contractor met with difficulties in driving the 42 x 13½-foot cofferdam at Pier 6. The 20-foot lengths of Bethlehem steel sheet piling were driven to a depth of 15 feet by a 3,070-pound drop hammer operated by a Northwest crane. A considerable amount of gravel and stone up to 6 inches in diameter and flat stones up to 9 inches in diameter were encountered at about this depth and constituted a layer about 5 feet thick. When driving of the oak piles began for the pier foundation the piles would just not go through this hard-packed layer. One or two out of the group of 60 for Pier 6 did go through, but most of them hung up at about 15 feet. The contractor resorted to steel shoes but this did not help matters very much.

One pile was driven to within 5 feet of the required penetration, taking a total of 8 hours of driving. Jetting with a 1-inch pipe with water under pressure

provided by a Gorman-Rupp pump was resorted to, but did not loosen up the ground sufficiently to permit the piles to be driven to the proper penetration and bearing. The caisson was kept unwatered by two CMC 30M and 40M self-priming pumps.

The Way Through

Since the jetting and steel shoes failed to aid the driving of the piles in the attempt to secure full penetration at Pier 6, the State Highway Commission permitted driving shorter piles of 20 and 22 feet in length. On later work on Pier 3, 450 feet west of Pier 6, the 30-foot piling was driven to full depth by using a jet. Pier 3 is about 90 feet from Test Hole No. 1 and excavation showed the same conditions as in the sounding, namely sand with some small gravel.

Personnel

The contract for the Cedar River Bridge, FAP 765, south of Mt. Vernon, Iowa, was awarded to A. Olson Construction Co. of Waterloo, Iowa, on a

bid of \$172,226.57 for the structure complete. The work was in charge of Jerry Diesch as Engineer and Howard Shaw as Superintendent of Construction for the contractor and C. M. Fisher was Resident Engineer for the Iowa State Highway Commission.

Get in the scrap! Search your yards and shops for scrap steel and iron and put it to work for Victory.

New Kotal Dealers

Four new distributors for Kotal, a waterproofing compound for use in bituminous construction and maintenance, have recently been announced. They are the Badger Surfacing Co., Oshkosh, Wis.; Truman L. Platt, Springfield, Ill.; Rock Hill Asphalt & Construction Co., St. Louis, Mo.; and the Merrill Engineering Co., Jackson, Miss.

ANTICIPATE Your Repair Needs AHEAD OF TIME for DAVENPORT-FRINK SNO-PLOWS



DAVENPORT BESLER CORPORATION
Made in Eastern U.S.A. by CARL H. FRINK, 1000 Islands, CLAYTON, NEW YORK

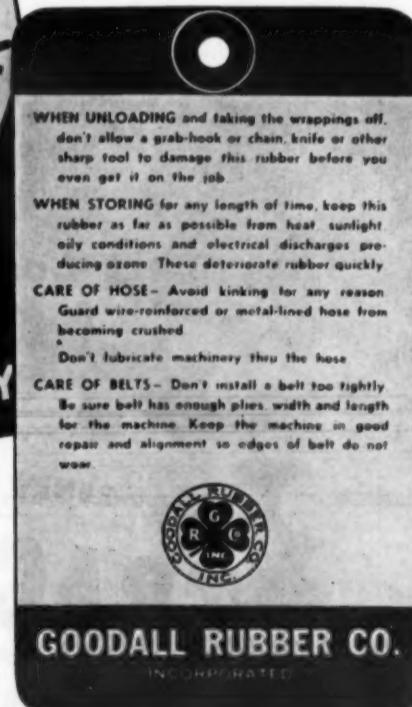
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Tagged TO HELP WHEN SHIPPED . . . SAVE RUBBER



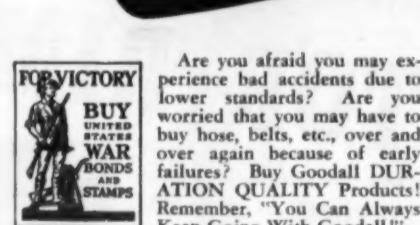
THIS TAG goes with every length or coil of GOODALL Hose and Belting, from the time it leaves our factory or warehouses until it is placed in service . . . a helpful reminder to every person handling it that *rubber must be conserved now* to avoid serious hindrance to our country's war effort.

This is just one more step GOODALL has taken to cooperate in every move designed to insure victory!



GOODALL DURATION QUALITY PRODUCTS

... hose, belting, boots and clothing . . . are engineered to last longer than regular standardized emergency products. GOODALL research laboratories are "building bricks out of straw" these days . . . developing new constructions that are the envy of the industry.



Are you afraid you may experience bad accidents due to lower standards? Are you worried that you may have to buy hose, belts, etc., over and over again because of early failures? Buy Goodall DURATION QUALITY Products! Remember, "You Can Always Keep Going With Goodall!"

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Special Equipment
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Write for descriptive catalog.

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GOODALL RUBBER CO. OF CALIF.

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RUBBER COMPANY INCORPORATED





This track turntable, built by Blaw-Knox Co. for use by contractors at a Pacific Naval Air Base, is believed to be the largest ever constructed. Designed to handle 3-axle 188-inch wheelbase Mack trucks which with payload weigh 55 tons, the turntable is self-powered by a gasoline engine.

A New Anti-Freeze, Stops Engine Rust

A permanent-type anti-freeze which, according to the manufacturer, contains no critical materials and is therefore available in unlimited quantity, was completely tested in substantial quantities last winter by thousands of individual car owners, as well as large commercial fleet operators. Known as No-Freeze, this product is guaranteed by the Great Northern Chemical Co., Inc., Oak Park, Ill., against freezing down to 35 degrees below zero; is not simply rust-resistant, but prevents the rusting of any part of the cooling system; is harmless to the engine, car finish or person; will not boil off or evaporate at engine temperatures; and never requires testing for anti-freeze strength.

It is stated that it contains no acid, calcium chloride, sodium chloride or other inorganic salts. The product is delivered in one-gallon glass jars, which may be saved for the storage of No-Freeze for re-use another season.

Complete information regarding costs and local distributor points will be furnished by the manufacturer to those mentioning this item.

New Specifications For Wood Preserving

In order to conserve chromium, copper and phenol compounds for vital war use, Emergency Federal Specifications for wood preservatives were recently issued by the U. S. Forest Products Laboratory and the Federal Specifications Committee, at the request of the War Production Board. These emergency formulae are offered as wartime substitutes, to be used where they will serve as suitable alternates to the standard chrome-bearing compositions for preservative treatment of lumber for military, war-plant, and other government needs.

Chromium compounds are used in wood preservatives as fungicides and mordants to prevent leaching of the preservative from impregnated wood. Phenolics and copper compounds are powerful fungicides. Over 1,500,000 pounds of chromates and 100,000 pounds of phenolics will be affected by the use of the emergency formulae.

Shovel Front for Sale

Northwest Shovel Front with 24' Boom, box type, 14' Dipper Stick, adjustable type. Bucket 36"x34"x-30" inside. Automatic crowd. Fits 104 or 105 Northwest. Price \$1,000.00 subject prior sale.

MAULE INDUSTRIES Ojus, Fla.

horizontal-split casing and are suited for motor, steam-turbine, belt or engine drive. They are built with a choice of material for different applications and are designed for high efficiency, dependability and low maintenance costs.

Copies of Bulletin W-312-B2C may be secured free on request by mentioning this item.

Tractor Shovel Catalogs

The line of Hough tractor-mounted loaders and shovels for use with Allis-Chalmers, Case and International tractors, as well as the Hough Payloader tractor shovel in two models, is described in a series of bulletins recently

issued by the Frank G. Hough Co., Libertyville, Ill.

Form MS281 describes Hough hydraulic shovels for use on heavy-duty Model WM Allis-Chalmers tractors; Form 106 covers hydraulic shovels for Case CI and DI industrial tractors; Hough cable-operated shovels for use with International Models T-6, TD-6, T-9 and TD-9 are described and illustrated in Form 136; Form 136A covers hydraulically operated tractor loaders for International Models I-4, I-6 and ID-6; while the Model HS Payloader is described in Form 129 and the Model HL in Form 138.

Any or all of these bulletins may be secured direct from the manufacturer.

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1 GMC flat-
1 International
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1 Ford Mar-
1 International
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1 GMC cam-
1 International
1 Ford true-
1 Chevrolet
1 FWD flat-
3 Chevrolet
1 Chevrolet
1 Ford high-
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1 Internatio
1 Caterpilla
3 Caterpilla
1 Allis-Cha
1 Internatio
13 Caterpilla
1 Caterpilla

IF IT'S A



PRODUCT—IT'S



Dependable!



"BOSS"

WASHER TYPE — STYLE W16 — FEMALE
HOSE COUPLINGS



"BOSS"

STYLE MX16 — MALE
HOSE COUPLINGS

Used with outstanding satisfaction and economy on steam, air and liquid hose for more than a quarter of a century. Designed for convenience in coupling and uncoupling, and to grip tight without damage to hose ends through application of sturdy malleable iron "BOSS" Interlocking Offset Clamp—the ultimate in clamping efficiency. Sizes: $\frac{1}{4}$ " to 4", inclusive.

For Washerless Female Couplings, specify "GJ-BOSS" Ground Joint Type, Style X-34.

Carried by Manufacturers and Jobbers of Mechanical Rubber Goods.

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VALVE & COUPLING CO.

MAIN OFFICE and FACTORY: PHILADELPHIA, PA.

BRANCHES: CHICAGO • BIRMINGHAM • LOS ANGELES • HOUSTON

They Last Longer.....Cost Less

RENEWABLE
TRACTOR RIMS
Made of
WEAR-RESISTING
STEEL

You'll save time and money
and get a heap more service
from your Caterpillar tractor
drive sprockets and idlers.
... Rebuild with renewable,
wear-resisting steel rims...
Easily installed... Welding
instructions furnished.

For Caterpillar Tractor
IDLER WHEELS
DRIVE SPROCKETS

ALLOY STEEL & METALS CO.

1862 E. 55TH ST. LAFAYETTE 0181 LOS ANGELES, CALIF.

Manufacturers of PACIFIC CRUSHING & SCREENING UNITS • PACIFIC SLUSHING SCRAPERS & SHEAVE BLOCKS • ALLOY-MANGANESE MILL LINERS & CRUSHER JAWS • PACIFIC ROCK BIT GRINDERS • HAND WINCHES • CRAWLER SHOES, TRACTOR RIMS and other Wearing Parts

Equipment Roster In Lancaster County

(Continued from page 17)

blade grader and one pick-up truck.

A patrol section is responsible for about 65 miles of road while a district maintenance outfit has 195 miles of road to look after and helps out the three patrols in its district. The patrols blade the surface of the road only, while the district maintenance outfit do the snow plowing, clean ditches, repair low spots in roads, resurface gravel roads and generally do the heavier maintenance work.

Of the 1,500 miles of county road, there are only 15 miles of surfacing, which include concrete, bricks and asphalt. Of the balance of the roads, 50 per cent are gravel-surfaced. Last year the county instituted a program to build some oil-mat surfaces on 6-inch compacted stone bases with the mat 2 inches thick. Lancaster County is unusually fortunate as it owns the only quarry within many miles in Nebraska and is therefore able to have a stone base for its roads, while even state highways in that territory must rely on Platte River gravel, the maximum size of which will pass a $\frac{3}{4}$ -inch screen.

Equipment

In the maintenance of 1,500 miles of road, Lancaster County requires a considerable amount of equipment, although compared to some counties which do a large amount of force-account construction its equipment roster is small. Much construction is done by contract. The equipment includes:

3 passenger cars
10 Ford 3/4-ton pick-up trucks
1 Dodge flat-bed truck
1 GMC flat-bed truck
1 International pick-up truck
2 Ford dump trucks
1 Ford Marmon-Herrington truck for snow-plowing
1 International-Coleman all-wheel-drive truck
5 Ford flat-bed trucks
1 GMC canopy truck
1 International panel truck for survey parties
1 Ford truck with 1,000-gallon gas tank
1 Chevrolet flat-bed truck
1 FWD flat-bed truck
3 Chevrolet dump trucks
1 Chevrolet suburban carryall for survey parties
1 Ford high-stake enclosed-body truck
8 district patrol trailers
3 Caterpillar Sixty tractors
4 Caterpillar Thirty tractors
1 International TD-18 tractor
1 Caterpillar D7 tractor
3 Caterpillar D6 tractors
1 Allis-Chalmers HD-7 tractor
1 International TD-14 tractor
12 Caterpillar No. 11 power graders
1 Caterpillar No. 9 power grader

- 1 Adams 15 power grader
- 2 Adams 50 power graders
- 5 Galion power graders
- 1 Austin-Western power grader
- 1 Allis-Chalmers power grader
- 2 Caterpillar elevating graders
- 1 elevating grader
- 1 Adams elevating grader
- 1 Caterpillar pulled grader with power-operated blade
- 3 Galion pulled graders with power-operated blades
- 5 Adams 10-foot pulled graders
- 3 Galion 10-foot pulled graders
- 14 Wansau V plows
- 11 Caterpillar V plows
- 1 Austin-Western V plow
- 2 Adams V plows
- 1 Galion V plow
- 1 Baker V plow
- 3 Sargent V plows
- 2 motor mowers
- 3 Jaeger 2-bag mixers
- 1 Rex 2-bag mixer
- 1 No. 236 Universal crushing and screening plant, capable of producing 16 cubic yards per hour

Personnel

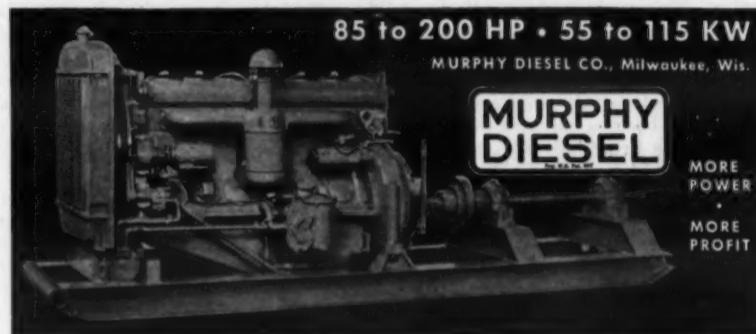
We spoke of the get-together which has proved so successful in the Lancaster County Engineering Department. This loosely knit organization has maintained a soft-ball team for three years on the proceeds of the soft drink and candy canteen in the shop, has bought a 16-millimeter projector and a daylight screen, and has financed the light refreshments for its monthly get-togethers during the

winter in the same manner. It also maintains a cribbage club which last year won the city championship.

L. W. Weaver is County Engineer of Lancaster County and head of the Engineering Department which consists of all of the service departments of the county. At the county garage, W. A. Schneider is Shop Foreman, and C. J. Neville is Storekeeper, assisted by Walt Meyer.

Safety Posters Free

The response to our offer of free safety posters, reprinted from the pictorial spread "Reduce Construction Accidents" in our July issue, has been very gratifying, and these posters are even now appearing on many Safety Bulletin Boards on important war-construction jobs. A few of these posters are still available. Write our New York Office.



**90% OF THE SAWING
IN WAR CONSTRUCTION
CAN BE MADE EASIER...QUICKER
WITH THIS "825"
SKILSAW!**

\$119
8 1/4 IN. BLADE
BEVEL-CUTS 2 IN.
ROUGH LUMBER
AT 45°

Save time with SKILSAW...cut openings for vents, ducts and stairs after sub-flooring is laid.

Save time with SKILSAW...cut trim decking after standard lengths are nailed on.

● With Model "825" SKILSAW you can make almost every cut called for in War Construction...and make them easier, better, faster! That's why Model "825" is such a favorite with War-Work Contractors everywhere.

Every feature you need today, is built right into this one lightweight, big-capacity, fast-cutting saw.

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Base Preparation For Airport Runways

(Continued from page 1)

of soil stabilized with portland cement.

The fact that the Air Corps wished to use one runway at the earliest possible date led to an unusual schedule of construction. The section where all three runways cross was constructed first, the sand-stabilized soil base mixed and compacted, and the asphalt base and wearing courses applied, before any work was done to apply base on either of the other runways. This procedure was followed because it would have been impossible to have laid top at the intersection when this runway was being used constantly by planes. But having once completed the intersection, work could proceed out from the center on either of the other runways without any conflict of interests.

Preparation of Subgrade

The subgrade material throughout the field is a silty clay loam not suitable as a base in its natural form. To prepare this as a satisfactory base for the asphalt top, 2 inches of sand was spread over the top and the material mixed mechanically into the top 2 inches of the natural soil, using a Flynn Road Builder with sufficient water added at the machine during the mixing to give optimum moisture. The mixed stabilized material was then compacted by Bros sheepfoot and rubber-tired rollers pulled by TD-9 tractors, bladed by an Austin-Western No. 77 power grader, and then rolled by an 8-10-ton Galion tandem roller.

During the months of August, September and October, 1941, nature was particularly kind to the contractor, as during this period the natural top soil cut from knolls at this site contained the optimum moisture and so gave the best compaction. The silty clay loam retained its moisture content tenaciously, so that it worked well under the sheepfoot rollers without drying.

As soon as the base was compacted, it was primed as close to optimum moisture as possible, using a coal tar with a viscosity of 8-13 at 40 degrees C. at the rate of 0.3 gallon per square yard, using an Etnyre 930-gallon distributor on a Ford chassis.

Loess as a Filler

Loess, a wind-blown deposit which

occurs throughout large areas along the bluffs bordering the alluvial valleys of the Mississippi and Missouri Rivers from as far south as Brandon, La., to the Minnesota border, has the ability to give a very tough character to an asphalt mix when used as a filler in place of limestone dust or other material. This characteristic is undoubtedly due to the extreme fineness of the individual grains of loess and the absence of flat or flaky particles. Its use in asphalt mixtures for airport runways is of particular benefit, as heavy traffic heals cracks or breaks in street paving, but runways have a negligible traffic and as loess prevents cracks and gives a more stable or tougher mix its use is increasing in areas where it is commercially available.

As prepared for use at the hot-mix plant of the contractor, about 2 miles distant from the airport, the loess was unloaded from gondola cars by a Marion crane with a 45-foot boom and 1-yard Blaw-Knox bucket and delivered to a loading hopper. Two men worked on this hopper, breaking down the material, as it has a tendency to arch, and seeing that it was delivered to a reciprocating feeder which delivered it to a bucket elevator, carrying it to a Warren Bros. drier. One man was stationed at the delivery point of the material to the drier, to prevent arching of the loess as it was spilled from the bucket of the elevator. A standard 60-inch Sturtevant exhaust fan driven by a 60-hp electric motor was used to pull the vapors from the drier.

The material passing through the drier was delivered to a scalping screw about 3 feet below the drier, equipped with $\frac{1}{8}$ -inch holes in a screen immediately below the top screw and above the bottom screw, both of which delivered the loess to the hot elevator. As the material came from the hot elevator, it was divided uniformly to two screw conveyors, one a right-hand screw and the other a left-hand, which fed the dried loess to four hummer screens with magnetic-type vibrators and equipped with 105-mesh wire screening, 3 x 8 feet in area and built in two sections. The oversize from these 105-mesh screens was delivered to a Gruendler hammermill by means of a pair of right and left screws picking up the oversize from the four screens and delivering it to a 6-inch pipe direct to the hammermill. Recovery of about 85 per cent of the oversize material was made possible by the use of the hammermill, which discharged directly into the hot elevator, providing a

closed circuit for the material. The material passing the four screens was delivered directly by screw to a hopper adjacent to the Barber-Greene asphalt mixing plant described below.

The Hot-Mix Plant

Sand for the hot mix was also deliv-

ered by gondola cars to the same siding as the loess and unloaded by the same crane to a separate hopper and reciprocating feeder to the cold elevator, which carried it up to twin Barber-Greene driers, from which it emerged to be carried by the hot elevator to the storage

(Concluded on next page)

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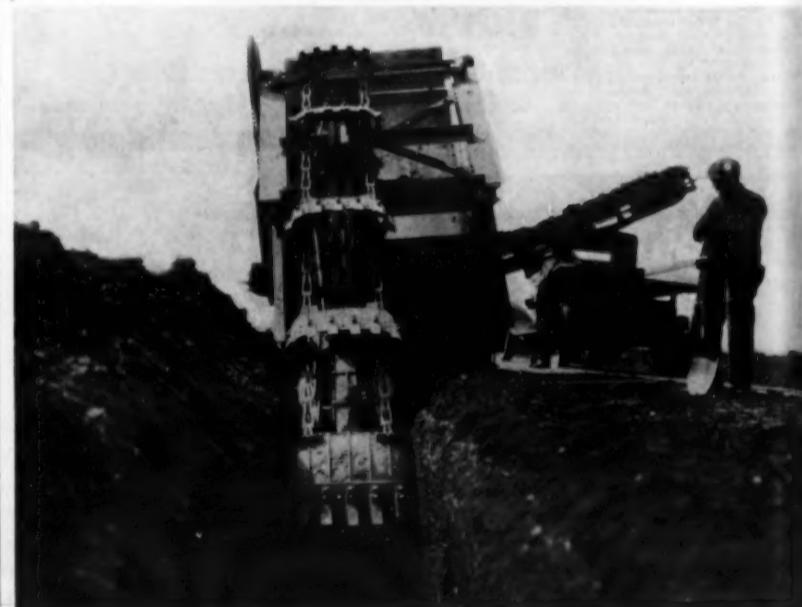
ing School Airport, Albany, Georgia.

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Plant and Methods For Runway Paving

(Continued from preceding page)

hopper at the top of the plant. The sand, with the proper proportion of loess, was metered by the traveling belt of the Barber-Greene machine and delivered to the continuous-type pugmill mixer for incorporation with the predetermined proportion of asphalt, and dumped direct into the hauling trucks at the end of the plant. The Barber-Greene hot mixing plant was operated by a Buda gas engine, and a steam engine was used to drive the Warren Bros. drier. Steam for this purpose, as well as for heating the asphalt tank cars and for atomizing the fuel oil, was supplied by a 125-hp horizontal boiler at 150 pounds pressure. Standard Oil of Louisiana asphalt was received in insulated tank cars and required very little additional heating for use at the contractor's plant.

The crew required to operate the hot-mix plant consisted of one man on the stockpile, one man at the bottom of the cold elevator, a fireman on the driers, the operator of the Barber-Greene mixing plant, and a man at the delivery end controlling the loading of the trucks.

Laying the Runways

The runway base course, 3½ inches thick, was laid down 10 feet wide by a Barber-Greene tamping-spreading-finisher in two courses of 2 inches on the bottom overlaid by a 1½-inch course. The contractor made a special effort to get the binder course laid over the entire area of the runways before winter, in order to protect the stabilized base and make it possible to continue laying top during all good weather throughout the winter until the paving was completed. The surface course was laid 1½ inches thick. In order to secure a maximum of stability and waterproofness in the laying of the three courses, two of base and one top, the contractor took special pains to break the joints, so that the three joints would not be in line vertically.

No tack coat was used between the base courses or between the upper base course and top course, although specifications provided for a tack coat when necessary. Each course was carefully swept ahead of the laying of the next course by two men with hand brooms,

to remove any earth or clay which might have been tracked on the lower course. No plane of weakness was found between any two courses when cores were taken over the entire area. This may have been due to the presence of loess, which gives a minute roughness to the surface which would aid in bonding the cold material and the fresh hot material.

When laying pavement, two men stayed close to the Barber-Greene spreader, shoveling in the hopper and cleaning the truck bodies, one man operated the spreader, two men worked on the wings, and a joint ironer followed up to smooth out the joints between adjacent lanes. In order to supply adequate material for a tight joint, all lanes were lapped about 1 inch. This was immediately ironed out and then rolled, insuring a dense tight joint.

The plant and spreader handled 60 tons of hot mix per hour at the start of operations, and this was boosted to 75 tons per hour when the Gruendler hammermill was installed to increase the production of fines in the loess.

Gradation of Mixes

The sand used for base course for the runways contained approximately 27 per cent of material retained on a 10-mesh sieve, all of which passed a ½-inch sieve. The typical material passing the 10-mesh sieve showed the following cumulative percentages retained on sieves of smaller mesh:

Retained on No. 20 sieve	9.8 per cent
Retained on No. 30 sieve	19.9 per cent
Retained on No. 40 sieve	42.4 per cent
Retained on No. 50 sieve	70.5 per cent
Retained on No. 60 sieve	93.5 per cent
Retained on No. 100 sieve	97.1 per cent
Retained on No. 200 sieve	98.8 per cent

The balance of the mix was comprised of 12.0 per cent of loess and 7.5 per cent of 85-100 penetration asphalt.

The following analysis shows a typical specimen of loess expressed in per cent finer than the mesh given:

100 mesh	99.2 per cent
200 mesh	94.8 per cent
400 mesh	82.6 per cent

The gradation of the aggregate used for the surface course was:

Retained on No. 20 sieve	5.0 per cent
Retained on No. 30 sieve	12.6 per cent
Retained on No. 40 sieve	30.9 per cent
Retained on No. 50 sieve	59.4 per cent
Retained on No. 60 sieve	89.4 per cent
Retained on No. 100 sieve	94.1 per cent
Retained on No. 200 sieve	97.0 per cent

The analysis of the loess is the same as that given for the base course. The mix was made up with 18 per cent loess for the surface course and 10 per cent asphalt of the same penetration as for the

base course, and the balance of 72 per cent was the sand of the gradation given above.

Personnel

The runway paving on this southern airport was done by contract under the direction of the U. S. Engineer Department. In the interest of national security, the location and mention of personnel connected with airport construction will be omitted for the duration.

New Pomona Pump Officer

C. Granniss Bonner, formerly Comptroller and more recently Treasurer of The Brunswick-Balke-Collender Co. of Chicago, has been elected Treasurer of Pomona Pump Co., Pomona, Calif. Mr. Bonner relieves Donald C. McKenna, Vice President and former Treasurer, who will devote full time to the increasing production activities of the company's four manufacturing plants.

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Lubrication and Fuel Important to Diesels

(Continued from page 15)

You can't afford a poor operator at any price, and by poor is meant one who abuses equipment. A check-up of downtime is not necessarily a good yard-stick, for other factors may enter into the situation. The best way is by observation over a reasonable period of time, and it should be someone's specific duty to do this.

Lubrication

The function of a diesel oil differs from that of a gasoline-engine oil for, besides lubricating and cooling it also has the job of cleaning. It should be able not only to resist heat; it should absorb and transfer heat. It should also absorb gum and carbon-forming fuel residues which produce ring sticking, that most pestiferous of diesel troubles. This latter function is not as important in gasoline-engine oil because gasoline forms less residues of that type.

Regardless of the type of oil you use, be sure that no inferior quality lubricant will be satisfactory. It is always far cheaper to use the best.

The best diesel lubricant is, in the first place, one that has been prepared specifically for diesels. Most of the oil companies have spent a great deal of time and money in laboratory research and field testing to produce oils which will fit diesel needs. They are designed to lubricate, wash away and absorb fuel residues, and absorb heat. Many of them are compounded with various additives which clean the engine, reduce friction, and improve film strength so that the oil will stand up under extreme heat and prevent welding of wearing surfaces.

Naphthenic base oils were the first oils used for the lubrication of diesel engines and are still giving excellent performance in certain types of engines, especially the low-speed stationary type. The introduction of the high-speed diesel and the engines with greater power output has necessitated the development of paraffin-type oils both with and without additives.

An oil that is best adapted for one engine is not necessarily suited for another. Oils should be selected with particular care, depending largely on the type

of bearing used, as there is danger of bearing corrosion at high temperatures if the oil you use, whether compounded or not, is not suited to the type of bearing in your engine. In the case of engines requiring a compounded oil, care should also be used in the selection of the proper type of filter as chemical and active clay-type filters will remove some of the compound, thus reducing the effectiveness of the oil.

If factory specifications do not tell you what type of oil to use, consult your local distributor for instructions. Follow the specifications telling you when to change the oil. Your filter will clean your oil, but will not keep it from wearing out. Laboratory technicians have not been able to tell just how an oil "wears out," but they have found that it does under the intense heat of engine conditions. That is, some of the portions of the oil break down, and as yet no method has been found for renewing or replacing them. When adding make-up oil, it is desirable to use the same brand of oil used to refill the crankcase.

Too much emphasis can not be placed on the importance of draining and refilling the crankcase at regular intervals. Many large contractors and highway departments use laboratory analysis to determine when oil should be drained, but by far the majority of operators depend on the appearance and level of the oil in the crankcase, which is at best an unsatisfactory and unsatisfactory way of handling the situation. It is also suggested that at least every 500 hours the crankcase should be flushed with a hot flushing oil in order to remove dirt and sediment in the bottom of the crankcase.

Never replace your filter with any but that specified for your engine, and you will retard oxidation, sludging, and accompanying wear. Remember that a day of use with worn oil may result in more engine wear than a year with efficient oil.

One way to insure regular check-ups of oil, as well as of other types of servicing, is to carry a card on the dashboard or at some other convenient place on every piece of equipment. Then oil changes, repairs, and other servicing can be noted on these cards, thus providing a record of such servicing as well as a reminder to do these things at regular intervals.

Fuel

The original conception that a diesel engine will run on almost anything—

oil drainings, kerosene, even soy bean oil—has probably been responsible for a great deal of carelessness with fuels among diesel owners.

A good diesel fuel is one that will ignite at low temperature. The fuel is ignited progressively as it enters the combustion chamber and comes in con-

tact with the air which has been compressed to a high degree in the cylinder. Fuels with good ignition quality are said to have a high cetane number. Since paraffin straight-run distillates have a comparatively high cetane number, they are satisfactory for diesel use. There are,

(Concluded on next page)



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Proper Diesel Care Is a Patriotic Duty

(Continued from preceding page)

of course, numerous satisfactory diesel fuels and diesel-engine owners are advised to follow the manufacturers' recommendations. The fuel which gives you the smoothest performance, with no uneven pressure rises, no knock, is the best.

It is a good thing to understand what the fuel knock is, for besides being the mark of a poor fuel, it is decidedly harmful to your engine. Unlike the gasoline knock which comes from pre-ignition, the diesel knock comes from improper delayed ignition. When the fuel charge enters the chamber, it should begin to ignite at once. If not, it piles up and may ignite with explosive force. Besides the strain on engine parts, the fuel knock may mean great loss of power with accompanying overheating. If the engine can not absorb the sudden power, most of the energy goes off in the form of heat. Rapid carbon formation and sticking rings may result, and more frequent overhauling is necessary. Pre-combustion-chamber types of engines are not particularly susceptible to fuel knock.

Altitude and Fuel

For those whose work lies in mountainous regions, altitude may be a considerable factor. Most diesels are adjusted for low altitudes, and the smaller oxygen content of the same volume of air at high altitude naturally affects the compression pressure. Engine efficiency decreases with altitude, but not in a constant ratio, so that the figures are somewhat involved. If a piece of equipment is permanently installed at high altitude, it might pay to have the necessary engine adjustments made to introduce more air into the engine. For ordinary operating conditions at high altitude, the best bet is to use the most efficient fuel you can find—and don't expect quite as much from your diesel.

In General, Remember—

1. Modern engines are sensitive to adjustments. A check-up a day keeps the repair man away, and an ounce of prevention is worth a pound of cure.
2. The planets rotate without grease or oil, but diesels have bearings. Use only the best oil on them.
3. Manufacturers spend millions of dollars to find out what is best for your engine. If you can improve on their specifications, you should get in touch with them.
4. Watch that dust bowl on your air cleaner. Every 4 hours is not too often to clean it under some conditions.
5. The fuel that costs the most may not be the best but, high or low, poor fuel is always expensive.
6. The operator who moves the most dirt isn't necessarily the best. If he cuts the life of one tractor in half, he's costing you plenty.
7. Know what the best is—the best oil, the best fuel, the best mechanic, the best operator—and use only the best.
8. Rapid progress is constantly being made in all types of equipment and supplies. Keep informed of the changes and don't expect the practices of five years ago to fit today's needs.
9. Modern engines are sensitive to adjustments. Like a violin, they should be tuned up before every performance.

Types of Asphalts And How They Work

A very practical discussion of the three types of asphalts and how they work forms a part of a very interesting paper on the maintenance of road surfaces with asphaltic mixtures, presented by E. E. Scholer, Shell Oil Co., Inc., St. Louis, Mo., before the Kentucky Bituminous Conference.

Mr. Scholer calls attention to the fact that there are three principal types of asphaltic materials on the market today:

1. There are cut-backs, either the MC or the RC, which are mixtures of an asphalt and an oily diluent. This diluent is added in order to produce ease of workability, but it must be largely lost by a combination of absorption and evaporation, before the road can satisfactorily withstand traffic.

2. Then there are emulsions which

are asphalts with a diluent of water which is added to assist the workability, and which must be lost before the road is given to traffic.

3. Finally there are the straight asphalts varying from 40 to 250 penetration. These asphalts are those which require heat to obtain workability, and lose workability when cold.

Mr. Scholer states that he likes to think of this transformation from a workable mixture to a stable mixture as a gain of viscosity. A cut-back, therefore, depends upon the loss of an oily diluent for the necessary gain in viscosity or viscosity change. An emulsion depends upon the loss of water to gain viscosity while a straight asphalt depends upon the loss of heat.

Mr. Scholer concludes, "I believe that every one will agree that we can depend a little more upon the loss of heat than we can upon the loss of a diluent. It is, therefore, evident that one is inclined to feel a little more sure of hot-mix construction, as we know the heat will be lost and we know, in addition, when it will be lost and to what degree."

A Push-Pull Hitch For Gravel Hauling

An unusual method of using industrial locomotives has been evolved by the Griffith Co. and Bent Co., contractors for Friant Dam in California. Early in 1940 they acquired three standard General Electric industrial diesel-electric locomotives of 43 tons and 300 hp each. Each locomotive was equipped with electro-pneumatic control and the other adjuncts required for multiple operation.

The gravel supply for the concrete-mixing plant at Friant Dam was on a river sandbar, about 3 miles south of the dam site. The original idea was to use two of the three locomotives in multiple for hauling a six-car gravel train back and forth from the river to the dam, and the third locomotive for general switching service.

Before full operation of the mixing plant was under way, Superintendent Harvey Slocum decided that instead of operating the two locomotive units together at one end of the train it would be safer to place one locomotive at each end of the train because the track parallels a highway and crosses it twice. By this arrangement the engineer was always at the front of his train and had full visibility of traffic conditions. Only one engineer was required, since multi-conductor control cable was run along the side of the train to connect the two locomotives.

Because these early locomotives had 12-volt control, some trouble was experienced at first with a voltage drop through the cable. Installation of an auxiliary relay in each locomotive corrected this trouble.

This method of multiple operation should offer advantages to users engaged in the same type of back-and-forth bulk-material transfer, provided they can use two smaller locomotives rather than one larger one. If other similar units are required in other operations about the plant, the operator then has the advantage of interchangeable units in case of failure on the part of one locomotive, or during servicing periods. Also, it is possible for the operator to use the units individually on other jobs as occasions arise.

Working for Victory

An interesting illustrated booklet entitled "LeTourneau Works for Victory" has recently been issued by R. G. LeTourneau, Inc., Peoria, Ill. This booklet tells the story of the part LeTourneau construction equipment is playing in the Victory effort, showing that the attack on the enemy begins with the construction equipment which clears the ground

and builds the bomber plants, moves the dirt to make new airfields, handles the grading for strategic highways, and many other construction operations. The photographs which help to tell the story show LeTourneau dirt-moving and material-handling equipment in use all over

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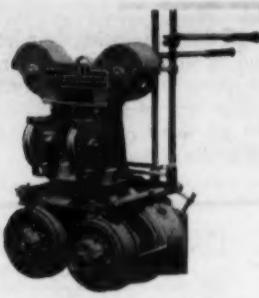
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The new Heil Model S-2 power control unit.

New Power Control For Dirt-Moving Units

Designed for use with all makes of tractors from 50 to 150 hp, the new double-drum Model S-2 Heil power control unit is an all-purpose unit providing two-line cable control for the operation of twin-cable scoops or for operating two single-cable units, such as a bulldozer-ripper combination.

Every effort has been made in the design and construction of these new units to insure increased output and reduce operating expense. Gears, bearings, shafts, housing and superstructure are made to withstand a line pull of 8,000 pounds on the bare drum with an ample safety factor. Finger-tip control is designed to provide immediate response with a minimum application of energy.

Other features of this power control unit include heavy-duty forged alloy steel main drive and reduction gears, with the gears and bearings completely encased in an all-welded steel gear case; garter-type oil seals to seal the gear case against oil leakage and dust infiltration; bevel cone-shaped clutches, fitted with molded linings; positive self-energizing brakes which automatically hold the load when the operating levers are released; and adjustments easily and quickly made without disturbing other parts of the unit. Rear power take-off adapters are provided to attach this power control unit to all current models of Allis-Chalmers, Caterpillar, Cletrac and International crawler tractors of 50 to 150-hp rating.

An illustrated bulletin on this Model S-2 power control unit may be secured by those interested direct from the Heil Co., 3,000 W. Montana St., Milwaukee, Wis., by mentioning this item.

Wider Roads on Hills Best Traffic Economy

The very exhaustive study recently completed by the Public Roads Administration and reported in *Public Roads* on the hill-climbing ability of motor trucks brings out a very important feature in the design of our highways. In order to enable motor trucks even to approach reasonable speeds on hills, all grades must be reduced to 3 per cent or less, or the engine power of our motor trucks must be more than doubled, or the gross vehicle weights must be reduced excessively, or some combination of these three must be used. Any one of these three solutions will still be costly

and practically impossible of immediate application.

The report very frankly states, "Before a final solution can be reached, the reasonable minimum speed must be determined and the relative economics of the three basic methods and of their combinations must be determined. The results do show plainly that it will not be possible to find a comprehensive solution."

There is, however, a very reasonable and rational solution to this problem. On all hills where large numbers of motor trucks operate over the highways, an extra traffic lane should be provided for the slow-moving heavy-haulage truck which in its present economical standardized design can not operate at the same speed as lighter traffic on hills and hence blocks the passage of such traffic unless it is given an up-grade lane for its own use. Several states have isolated projects where this has been done, carrying the effort to the extent of giving the top surface of the added lane a distinctive color. Such a project on U. S. 60 at Fort Knox, Ky., was described in the December, 1940, issue of *CONTRACTORS AND ENGINEERS MONTHLY*.

New Portable Compressors

Introduced in 1934 by the Chicago Pneumatic Tool Co., 6 East 44th St., New York City, CP two-stage air-cooled portable compressors have since demonstrated their performance and dependability, the manufacturer states. Now CP has introduced a new line of portable compressors retaining all of the time-proven features of its older line, according to the manufacturer, and adding new economy insuring from 15 to

35 per cent more air per gallon of fuel consumed; new gradual speed regulator that varies the speed gradually, not by steps, but up and down exactly as the air demand varies; greater portability due to lighter, more compact construction; and lower maintenance cost be-

cause of the gradual speed regulation, increased valve and port areas, and other refinements.

A new catalog, No. 758-1, recently issued, describes these new features in detail and illustrates them. Copies may be obtained from the manufacturer.



WILLIAMS "SUPER-HI" TENSILE TIE RODS INEXPENSIVE U. S. STANDARD THREAD RODS

1/4" long thread, each end 1/4" diam. U. S.—20 thread			1/4" long thread, each end 1/4" diam. U. S.—16 thread			1/4" long thread, each end 1/2" diam. U. S.—13 thread		
6,000 lbs. Ultimate Tensile 4,800 lbs. Working Load per Rod			9,500 lbs. Ultimate Tensile 7,500 lbs. Working Load per Rod			16,500 lbs. Ultimate Tensile 13,000 lbs. Working Load per Rod		
LENGTH of Rod	Price per 100 Rods	App. Wall Width	LENGTH of Rod	Price per 100 Rods	App. Wall Width	LENGTH of Rod	Price per 100 Rods	App. Wall Width
12" or less	\$2.00	15" or less	12" or less	\$3.00*	15" or less	12" or less	\$4.00*	15" or less
13"	2.17	16"	13"	3.25	16"	13"	4.33	16"
14"	2.33	17"	14"	3.50	17"	14"	4.67	17"
15"	2.50	18"	15"	3.75	18"	15"	5.00	18"
16"	2.67	19"	16"	4.00	19"	16"	5.43	19"
17"	2.83	20"	17"	4.25	20"	17"	5.87	20"
18"	3.00	21"	18"	4.50	21"	18"	6.00	21"
19"	3.17	22"	19"	4.75	22"	19"	6.33	22"
20"	3.33	23"	20"	5.00	23"	20"	6.67	23"
21"	3.50	24"	21"	5.25	24"	21"	7.00	24"
22"	3.67	25"	22"	5.50	25"	22"	7.33	25"
23"	3.83	26"	23"	5.75	26"	23"	7.67	26"
24"	4.00	27"	24"	6.00	27"	24"	8.00	27"
Price per add'l inch			Figure rods from 2" to 5" less than Wall for Vibra-Lock			Price per add'l inch		
\$0.0015			\$0.0023			\$0.0031		
Price per add'l foot			Price per add'l foot			Price per add'l foot		
\$0.018			\$0.0276			\$0.0372		
Price per add'l 100 ft.			Price per add'l 100 ft.			Price per add'l 100 ft.		
\$1.80			\$2.76			\$3.75		
Lengths over 20' add for Williams High Tensile Couplings per 100			Lengths over 20' add for Williams High Tensile Couplings per 100			Lengths over 20' add for Williams High Tensile Couplings per 100		
\$2.75			\$3.75			\$4.75		

* Rods under 12" in length knurled to prevent turning in concrete.

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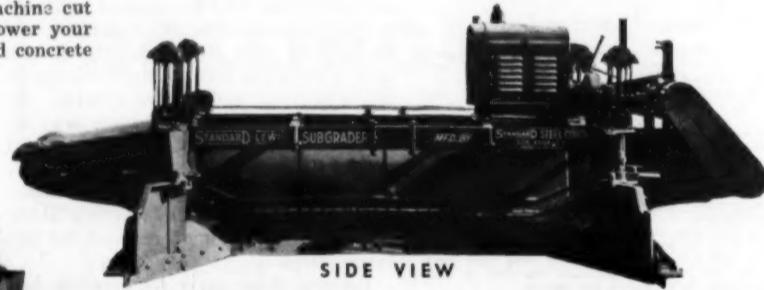
Williams Vibra-Lock—for Dams, Bridges, Heavy Construction, Battered Walls, etc. Williams Simplex—for Commercial Buildings, Sewage Disposals, Filtration Plants, Architectural Concrete, etc.

Send us your plans: We figure the ties, showing locations, etc.

Williams Form Engineering Corp., 46 East Hall St., Grand Rapids, Mich.

Make YOUR subgrading operations pay a profit:

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This machine is building most of the airports in the West.

Detailed records to substantiate this claim are obtainable from contractors using these subgraders. Write us for further information.

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How Indiana Acquires Highway Right-of-Way

(Continued from page 29)

as to their duties, immediately or at some future time. When they have been sworn and instructed, they view the property and make their return to the court on or before the date fixed in the order of the court appointing them. The defendant or the plaintiff, or both, may file exceptions to the appraisers' award. This action has the effect of vacating the award and the case is tried before the circuit court *de novo*. If neither party files exceptions to the award, the case is automatically settled and the defendant is authorized to draw the amount of the award previously deposited with the clerk of the court. Few people like law suits, especially condemnations. But when the law of eminent domain is properly explained, then such cases are usually conducted on a friendly basis and with satisfactory results.

Financing Right-of-Way

The State of Indiana finances right-of-way costs on all projects for the extension of its highway system and for widening and improving roads in its system under the normal yearly programs set up for improvement and construction, excepting on highways through cities and towns of 3,500 or more population. Cities and towns of this size and larger finance right-of-way within their corporation limits as provided in Section 2, Chapter 256, Acts of 1937, Indiana General Assembly.

Section 20 of this same Act authorizes County Boards of Commissioners and municipalities to procure by grant, donation, purchase or condemnation the necessary rights-of-way for improvement and construction of feeder roads out of the funds of such county or municipality.

Wartime Acquisition

The acquisition of right-of-way for a Federal project does not alter Indiana's procedure in normal times. However, since the Defense Highway Act of 1941 was passed by the Federal Government, states may request Federal Aid in securing and clearing right-of-way on access roads and for replacing roads that are shut off from general public use at military and naval reservations and defense-industry sites. Right-of-way on such roads is financed by the Federal Government.

In wartime as well as in peace time, the acquisition of rights-of-way for road construction requires the services of qualified land agents if the rights and best interests of the commonwealth as well as the individual property owner are to be protected.

New Rex Dealers

Announcement has been made by the Chain Belt Co., Milwaukee, Wis., of the appointment of the Industrial Equipment Co., 1301 59th St., Oakland (Emeryville), Calif., as distributor of

Rex construction machinery in the Bay area. This company has a new modern building with excellent service facilities manned by experienced service mechanics. R. W. Christofferson is General Manager and Ray Smith, Sales Manager, of the Industrial Equipment Co.

Another new distributor, recently ap-

pointed to handle Rex construction machinery in the state of Nevada, is the Sanford Tractor & Equipment Co., 500 East 4th St., Reno, Nev. This company, headed by Leslie M. Sanford, maintains an excellent service shop to give contractors in their area quick and reliable service.

Dependable power for vital airfield construction — with LE ROI ENGINES

When your equipment is Le Roi-powered, you know you have extra power for the pinches—dependable power for the long pull—economical power to keep costs down. * Below you see a Barber-Greene bituminous paver laying runways at a Mid-

western airfield. Construction men everywhere are depending on Le Roi engines in critical situations today — to help them hold a reputation for coming through on time. Get Le Roi power on your next equipment. *Le Roi Company, Milwaukee, Wis.*

E-12

Many leading types and makes of construction equipment are Le Roi-powered.



Join up with the U.S. TRUCK CONSERVATION CORPS

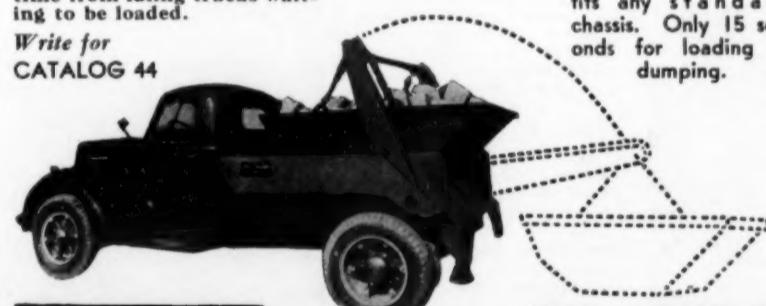
Owners, drivers and contractors are cooperating with the government to "keep the trucks rolling" by proper maintenance and conservation in accordance with the ODT's new program.

You can go still farther in conserving trucks and increasing efficiency by mounting a Brooks LOAD LUGGER

on every available chassis . . . thus making one truck do the work of many by utilizing 5 to 10 dump buckets . . . loading, hauling and dumping continuously . . . with no waste time from idling trucks waiting to be loaded.

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Texas Co., The (lubricants) 6
Thew Shovel Co. 8
Thompson Materials Corp. 18

Union Fork & Hoe Co. 49
Union Iron Works, Inc. 12
Universal Crusher Co. 22
Universal Power Corp. 20

Viber Co. 29

Walter Motor Truck Co. 16
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Contractors and Engineers Monthly



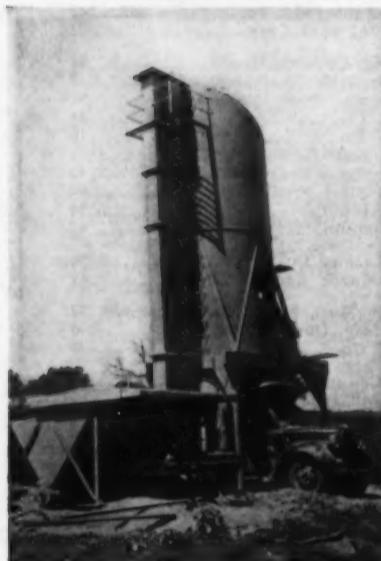
The welded A-frame of pipe for holding strip steel in the stockroom at the Lancaster County, Nebraska, Central Garage.



C. & E. M. Photos
Walt Meyer, Assistant Storekeeper, at his desk in the Lancaster County garage, beside a rack of shelves containing small brass parts in metal capped bottles.
See page 2.



A part of the rack for handles for various tools, and adjacent a series of bins for mower parts at the Lancaster County garage.



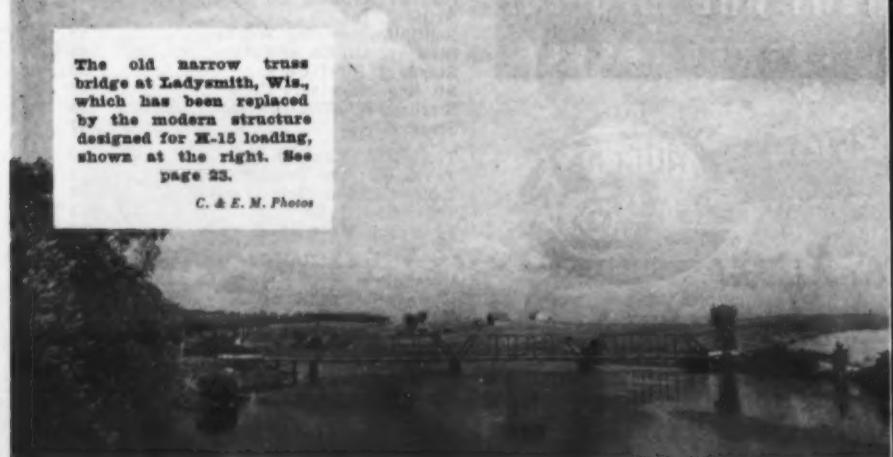
C. & E. M. Photos
Right, a novel device on the hand-operated belting machine behind the longitudinal finisher. A catenary of $\frac{3}{4}$ -inch garden hose resting on the surface helped to strike off any lumps ahead of the belt on the R. McCalman concrete paving job on U. S. 40 in Indiana.



C. & E. M. Photo
Cleaning the base with a Hough rotary broom prior to priming on the Harco Construction Co. 6-mile stabilized base contract on State Route 184 in western Iowa. See page 25.



C. & E. M. Photo
At right, wagon drills and portable compressor working at one end of the 50,000-yard rock cut on the M. A. Gammino grading job on Louisquissett Pike, R. I., Route 146. See page 25.



The old narrow truss bridge at Ladysmith, Wis., which has been replaced by the modern structure designed for H-15 loading, shown at the right. See page 23.

C. & E. M. Photos

